

2014 ANNUAL REVIEW

# COMBATING TERRORISM TECHNICAL SUPPORT OFFICE







**“...in this century, we have faced a more lethal and ideological brand of terrorists...with access to technology that allows small groups to do great harm, they have embraced a nightmarish vision that would divide the world into adherents and infidels - killing as many innocent civilians as possible, employing the most brutal methods to intimidate people within their communities.”**

*President Barack Obama, Sept. 24, 2014*

For nearly 30 years, the Combating Terrorism Technical Support Office (CTTSO) and its interagency and international partners within the Technical Support Working Group (TSWG) have faced an array of perverse and indefensible threats as described in President Obama’s statement. The cooperative efforts of allied nations have degraded the leadership of core al-Qa’ida, but the past year has also witnessed the rise or continuing march of misanthropic entities such as the Islamic State of Iraq and the Levant (ISIL) and Boko Haram. Events in 2014 offered tragic reminders of the tactics and strategic aims of groups that seek to perpetrate violence against Western nations and the regions where those groups find refuge and safe haven. The acts perpetrated by these groups serve as a recurring reminder of how the U.S. and key allies can harness the potential of technology and innovation to prepare for, prevent, mitigate, and respond to future acts of terrorism.

This Annual Review reflects a contemporary snapshot of science and technology projects which support or enhance the CT capabilities of Americans and international partners who share in the responsibility to prevent or respond to terrorist attacks. This Annual Review should not be viewed as a comprehensive or exhaustive catalogue of all of the technology and capability development activities undertaken by CTTSO. But, many of the examples of successful recently-concluded or ongoing projects will serve as a direct illustration of what can happen when the creative powers of government, academia, and industry are cooperatively brought to bear on the most compelling problems of our time.

With that in mind, 2014 was certainly not without its challenges. Noticeably missing from this year’s Annual Review is the Irregular Warfare Support (IWS) Program. Due to fiscal constraints, funding for the IWS Program, along with the Explosive Ordnance Disposal/Low-Intensity Conflict (EOD/LIC) Program will be phased out by the end of FY 2016. However, our commitment to the requirements of these mission areas is unwavering. The bulk of the IWS Program has transitioned to a new subgroup within TSWG, the Irregular Warfare and Evolving Threats Subgroup, which is highlighted in this Annual Review. At the beginning of FY 2015, the Improvised Device Defeat Subgroup expanded their mission to absorb the EOD/LIC mission under a new name, the Improvised Device Defeat and Explosives Countermeasures Subgroup, to focus their efforts on countering terrorist and criminal use of explosives, the global proliferation of improvised devices, and emerging explosive threats.

While the challenges set before us are great, far greater are the opportunities to meet the continued needs of our end users on the front lines.

**“...we continue to face a terrorist threat. We cannot erase every trace of evil from the world, and small groups of killers have the capacity to do great harm. That was the case before 9/11, and that remains true today.”**

*President Barack Obama, Sept. 10, 2014*



THIS PAGE  
INTENTIONALLY  
LEFT BLANK



# TABLE OF CONTENTS

## **The Combating Terrorism Technical Support Office**

- 6 Organization
- 9 International Program

## **Technical Support Working Group**

- 11 History and Mission
- 12 Organization and Structure

## **The Technical Support Working Group Subgroups**

- 14 Advanced Analytic Capabilities
- 20 Chemical, Biological, Radiological, Nuclear, and Explosives
- 28 Improvised Device Defeat
- 34 Investigative and Forensic Science
- 40 Irregular Warfare and Evolving Threats
- 44 Personnel Protection
- 50 Physical Security
- 56 Surveillance, Collection, and Operations Support
- 60 Tactical Operations Support
- 70 Training Technology Development

## **Explosive Ordnance Disposal/Low-Intensity Conflict**

- 76 Organization, Funding, and Program Information

## **Appendix**

- 81 BAA Information Delivery System (BIDS)
- 82 2014 Performers
- 88 Glossary of Acronyms
- 92 Photo Credits



# COMBATING TERRORISM TECHNICAL SUPPORT OFFICE



# VISION

Identify requirements to combat terrorism and provide solutions to war fighters, first responders, and other front-line users as rapidly as possible.

# MISSION

The mission of the CTTSO is to identify and develop capabilities to combat terrorism and irregular adversaries and to deliver these capabilities to Department of Defense (DoD) components and interagency partners through rapid research and development, advanced studies and technical innovation, and provision of support to U.S. military operations.





## ORGANIZATION

The Assistant Secretary of Defense for Special Operations/Low-Intensity Conflict (ASD (SO/LIC)) established CTTSO in 1999 to consolidate its research and development programs previously administered by the Office of the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence). The research and development effort that supports the interagency Technical Support Working Group (TSWG) was the first program to transition to CTTSO. The TSWG is divided into 10 subgroups, each chaired by senior representatives from federal agencies and national organizations with special expertise in those functional areas. The Explosive Ordnance Disposal/Low-Intensity Conflict (EOD/LIC) Program, which develops advanced technologies for Joint Service EOD and Special Operations Forces (SOF) missions, transitioned in 2001. In 2007, the Irregular Warfare Support (IWS) Program was initiated to satisfy a growing need to improve the capacity of the United States to counter insurgencies and fight an irregular war.



### The CTTSO and Other Agencies

The CTTSO is charged with providing a forum for interagency and international users to discuss mission requirements to combat terrorism, prioritize these requirements, fund and manage solutions, and deliver capabilities. The CTTSO accomplishes these objectives through rapid prototyping of novel solutions developed and field tested before the traditional acquisition systems are fully engaged. This low-risk approach encourages interdepartmental and interagency collaboration, thereby reducing duplication, eliminating capability gaps, and stretching development dollars.





The CTTSO accomplishes its mission in three ways. First, CTTSO takes operational requirements from warfighters, incorporates policy priorities of the Department of Defense (DoD) civilian leadership<sup>1</sup>, and rapidly identifies, develops, and delivers advanced capabilities for Special Operations Forces and General Purpose Forces to improve the capacity of the DoD to combat terrorism and irregular adversaries. Second, CTTSO collaborates with and supports related requirements of non-DoD U.S. government agencies and state/local/tribal governments to understand those users' priorities and requirements to share expertise, and to develop mutually beneficial capabilities. Third, CTTSO works with partner country ministries of defense under bilateral arrangements to conduct cooperative research and development, which allows the U.S. DoD to leverage foreign experience, expertise, and resources in the fight against terrorists and their infrastructure.

## Technology Transition

Technology transition is the process of taking a technology from the developmental and prototype phase to production and deployment by the end user community. Transition success is achieved when research and development products have evolved to the commercial market and/or have been inserted into government acquisition programs and can be easily and continuously obtained by the combating terrorism community. The path from the research and development phase to transition success can be challenging, and it is the mission of the Technology Transition program at CTTSO to help overcome transition challenges to ensure success for the developers and end users. The Technology Transition program at CTTSO works with internal program managers, external government agencies, end users, industry, and developers to overcome any barriers that may prohibit the successful transition of CTTSO technologies.

Planning for technology transition starts at the beginning of the CTTSO business cycle and continues throughout the lifecycle of the program. In order to increase the likelihood of transition success, Technology Transition Plans are developed to provide a framework for how the technology will transition to the commercial market and/or government acquisition. Topics discussed in the Technology Transition Plan include:

- The capability gap addressed by the development of the technology;
- Identifying customers and defining the market size;
- Understanding and managing intellectual property and data rights;
- Production strategies, including partnering, investment capital, and licensing;
- Commercialization and affordability;
- Environment, safety, and regulatory issues;
- Security and export control provisions;
- Test and evaluation planning and independent operational testing; and
- Operational suitability and operational support planning.

The keys to accelerating the complicated process of moving many prototypes to production includes having a disciplined process, available assistance, and teamwork among the project manager, technology transition managers, and developers. Additional information is available at the Technology Transition section of the CTTSO website, <http://www.cttso.gov>.

## Innovation

In the current budget environment of focusing on doing more with less, the need for innovation increases as we look for new ways to combat terrorism. Novel solutions come from individual entrepreneurs and tinkerers, and in order to leverage those solutions, CTTSO must constantly look for ways to actively engage them. The Innovation program at CTTSO has, at its core, the following objectives:

---

<sup>1</sup>Applicable policy guidance includes Presidential National Security Strategy, Defense Strategic Guidance, and any guidance or instructions issued by the ASD (SO/LIC).



- Identify new ways to obtain success, rather than uncertain development, through prizes, challenges, and other rewards;
- Provide additional tools and resources to fulfill operational capability gaps;
- Increase the number and diversity of solution providers;
- Provide rapid and agile ways of doing business that lower both cost and risk.

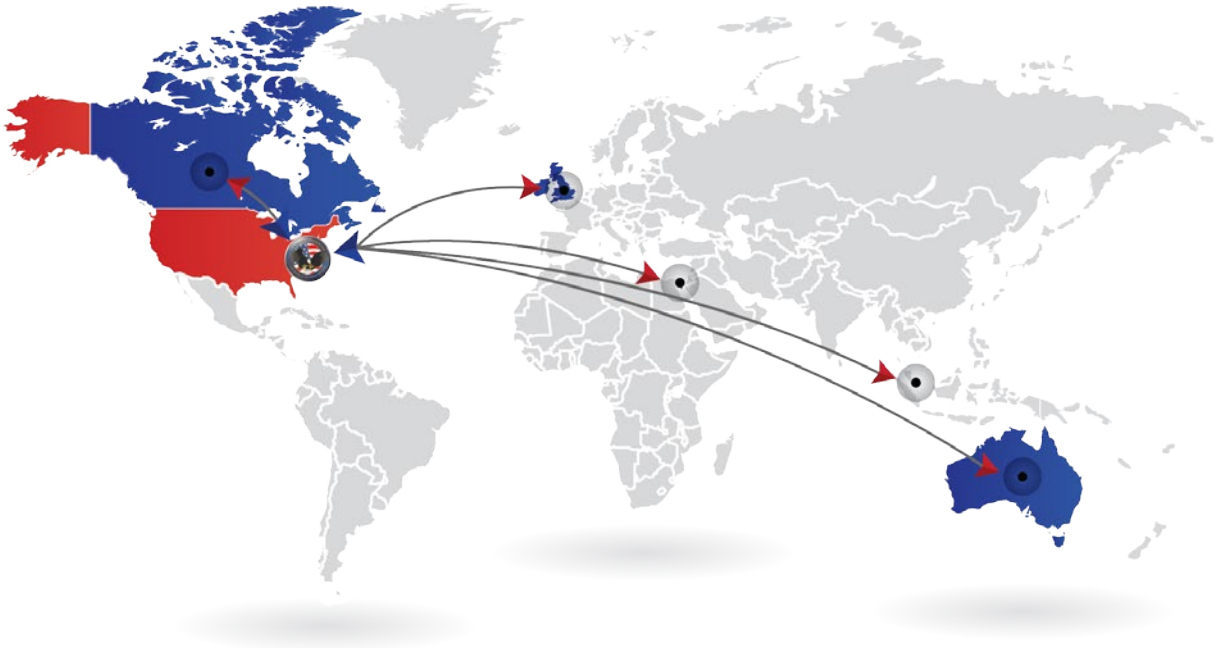
Innovation is a model that enables Government research and development programs to identify the best solutions in the shortest amount of time possible at a lower cost. In 2014, CTTSO made great strides in expanding its innovative ways of conducting business. The following initiatives are underway at CTTSO to support the Innovation program.

- FY14 Rapid Innovation Fund: Facilitates the rapid insertion of innovative small business technologies into government systems or programs that meet critical national security needs.
- Challenge Driven Innovation: Crowdsourcing challenging problems to the world to provide ideas and solutions to fulfill important scientific and technical challenges.
- In-Q-Tel: Not-for-profit strategic investor who identifies, adapts, and delivers innovative commercial technology solutions to support the missions of the U.S. government.
- Global Security Challenge: Identifies promising small business concept projects from around the world to provide next generation cyber security.





# INTERNATIONAL PARTNERS



## A Unified Goal

International cooperation allows CTTSO to leverage foreign experience, expertise, resources, and infrastructure in a unified approach against terrorism for the benefit of all. Therefore, in addition to its domestic interagency efforts, CTTSO directly manages bilateral agreements with five partner countries:

- Australia
- Canada
- Israel
- Singapore
- United Kingdom.

The partnerships provide insights into regional affairs, access to a broader technology base, and allows for the use of unique facilities offered by each country. Each of the agreements are 50/50 cost shared, comprised of financial and non-financial contributions, to address joint requirements, reducing duplication of efforts and scientific trial and error. Bilateral meetings are held twice a year, once in the United States and once in the partner country, to review ongoing projects and to discuss new areas of collaboration.

In addition to CTTSO's bilateral partners, CTTSO cooperates with other countries when appropriate.

Dozens of operational capabilities developed with CTTSO partners are currently in service with a variety of personnel both throughout the United States and around the world.



# TECHNICAL SUPPORT WORKING GROUP



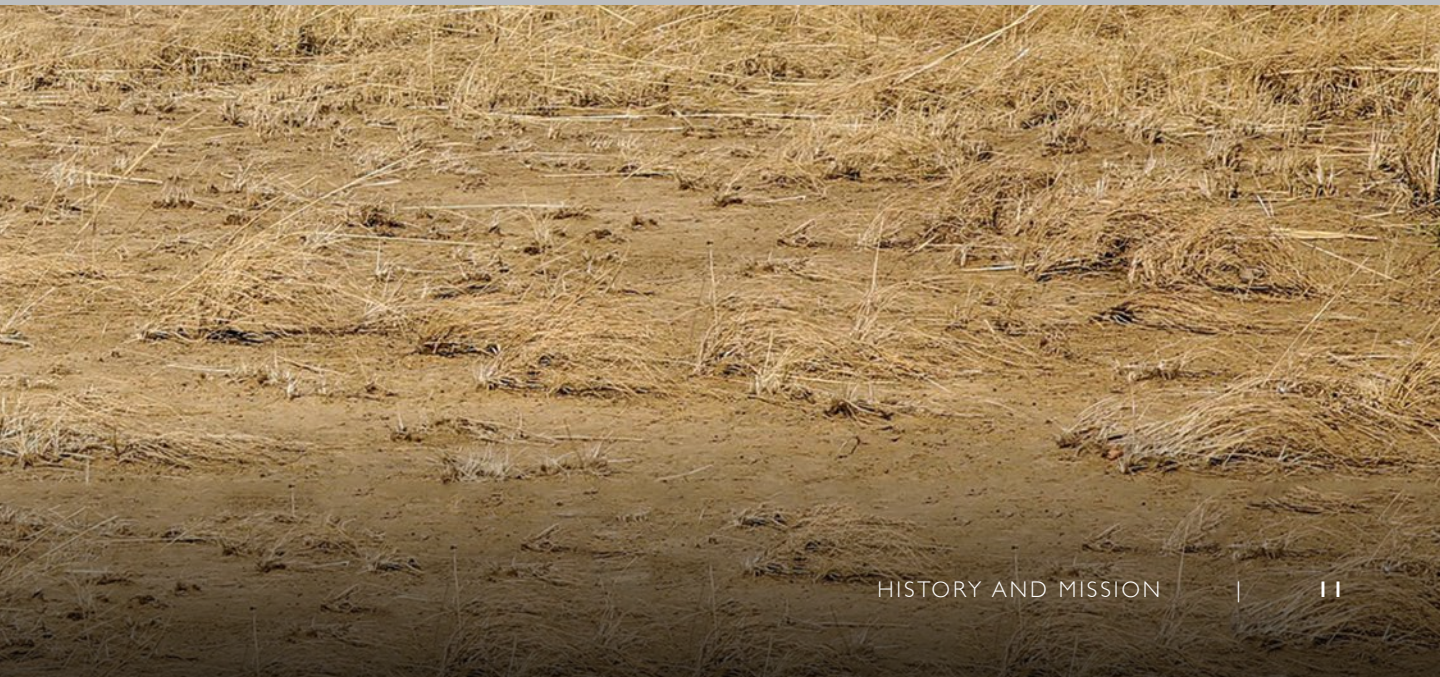


# HISTORY AND MISSION

In April 1982, the National Security Decision Directive 30 assigned responsibility for the development of an overall U.S. policy on terrorism to the Interdepartmental Group on Terrorism (IG/T), chaired by the Department of State (DOS). TSWG was an original subgroup of the IG/T, which later became the Interagency Working Group on Counterterrorism (IWG/CT). In its February 1986 report, a cabinet level Task Force on Counterterrorism, led by then Vice-President Bush, cited TSWG as assuring, “the development of appropriate counterterrorism technological efforts.”

Today, TSWG still performs that counterterrorism technology development function as a stand-alone interagency working group. TSWG’s mission is to identify and prioritize the needs of the national interagency community through research and development programs for combating terrorism requirements. TSWG delivers capabilities to those on the front lines through rapid research and development, test, and evaluation, while providing operational support. TSWG incorporates available expertise and experience from government, commercial, private, and academic sources throughout the United States and the world.

TSWG initiates efforts to influence longer-term research and development initiatives and balances its technology and capability development efforts among the four pillars of combating terrorism: antiterrorism, counterterrorism, intelligence support, and consequence management.





## ORGANIZATION AND STRUCTURE

TSWG operates under the policy oversight of the Department of State Bureau of Counterterrorism and the management and technical oversight of the Department of Defense Assistant Secretary of Defense for Special Operations and Low-Intensity Conflict. TSWG's core funds are derived principally from the Department of Defense and the Department of State, while other departments and agencies contribute additional funds and provide personnel to act as project managers and technical advisors. TSWG has successfully transitioned capabilities to the Departments of Agriculture, Defense, Homeland Security, Justice, State, and Treasury; the Public Health Service; and many other departments and agencies. Additionally, TSWG has transitioned many systems to state and local law enforcement. TSWG membership includes representatives from more than 100 government organizations. Participation is open not only to federal departments and agencies, but also to first responders and appropriate representatives from state and local governments and international agencies. These departments and agencies work together by participating in one or more subgroups.

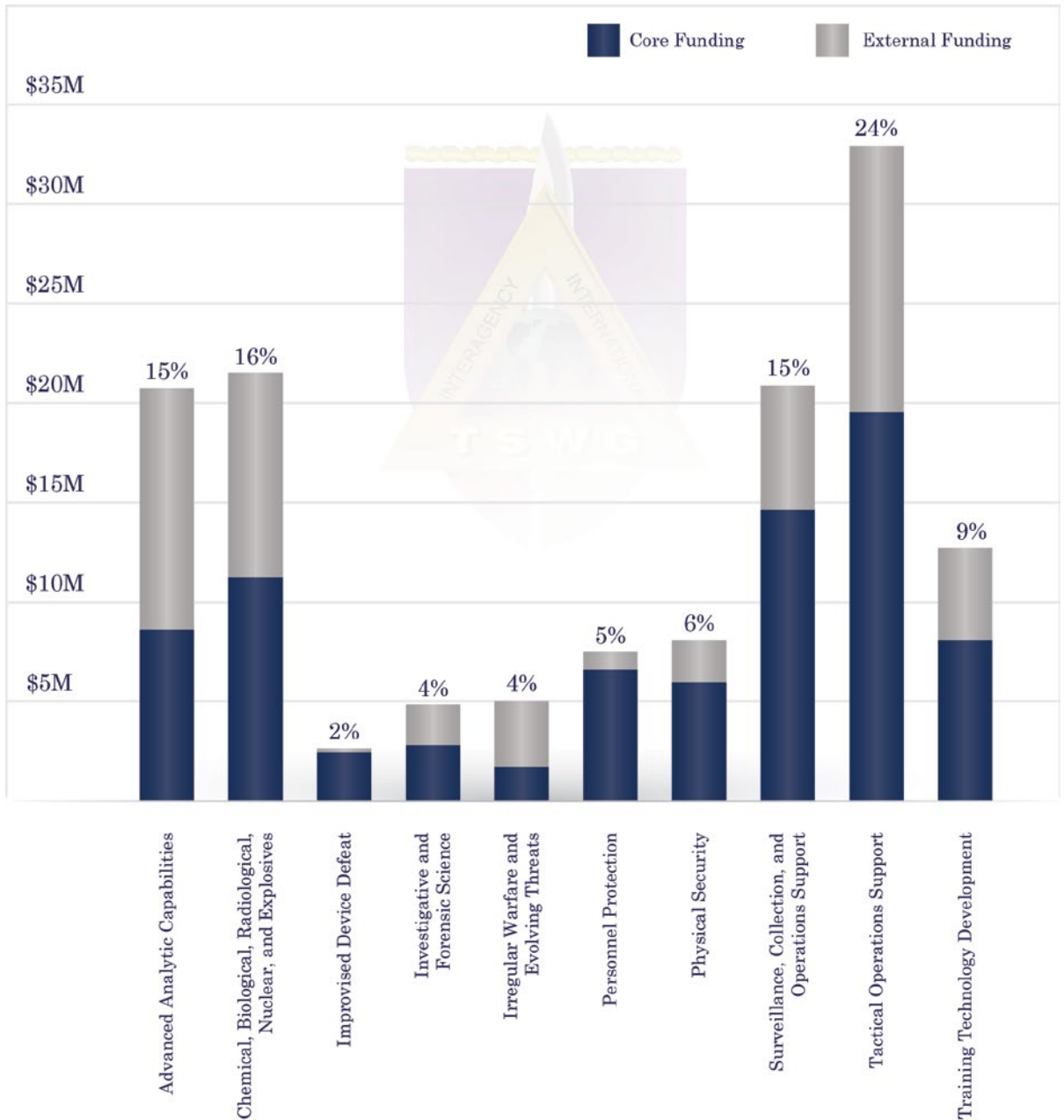
TSWG's subgroups are chaired by senior representatives from DoD, other federal agencies, and national organizations with special expertise in those functional areas. Chairmanship of 10 subgroups is shared as indicated in the organizational chart below.







# TSWG FISCAL YEAR 2014 PROJECT FUNDING (\$137M)





## ADVANCED ANALYTIC CAPABILITIES



# MISSION

The Advanced Analytic Capabilities (AAC) Subgroup identifies, prioritizes, and executes research and development projects that enhance the capabilities and processes of DoD and interagency operators including their intelligence and planning support by integrating analytic tools, models, and data to enable faster, better decision making.

# FOCUS AREAS

## **Data to Decision Systems**

Integrate and deploy analytic tools, models, and data to enable improved forecasting, and decision making about the human domain and non-kinetic effects in planning and operations under uncertainty. The focus area addresses predictive analytics, optimization, stability, and robust analyses, as well as higher order consequences to enable better decisions and faster adaptation while minimizing negative impacts.

## **Decision, Planning, and Analytical Tools**

Develop tools, models, and enabling technologies that provide analytic rigor to the military and interagency planning and decision making process for counterinsurgency and counterterrorism operations and campaigns.

## **Integrated Analytic Platforms**

Develop and deploy robust integrated platforms that both operators and intelligence analysts can use to synchronize operations and intelligence at the tactical level.

*[aacsubgroup@cttso.gov](mailto:aacsubgroup@cttso.gov)*

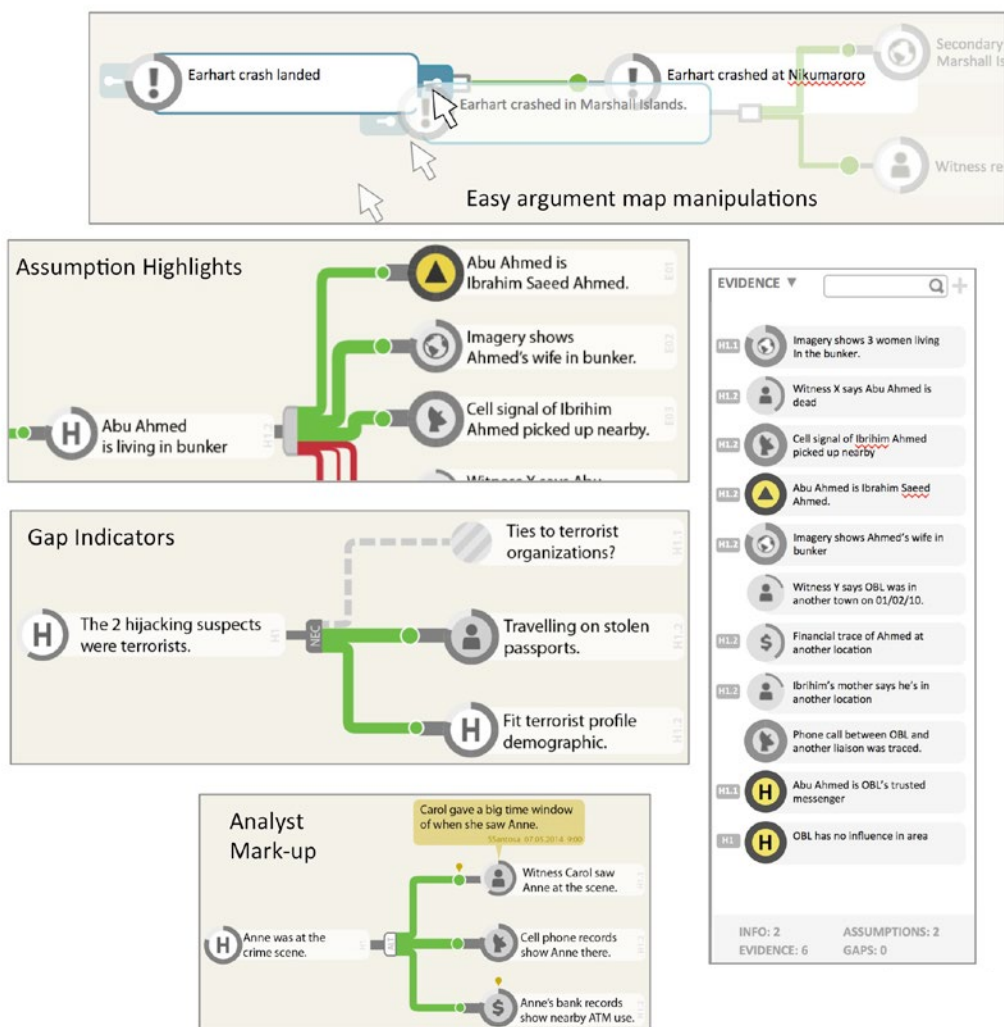




## AAC COMPLETED PROJECTS

### Argument Mapper Tool (Critical Thinking Tool)

CTTSO and Oculus Info Inc., in collaboration with the Intelligence Community, applied the conceptual foundations and machine reasoning theories developed by George Mason University's Learning Agent Center to refine the Critical Thinking Tool or Argument Mapper Tool as it is now called. The Argument Mapper Tool supports the application of evidence-based problem solving and decision making. Visualization increases an analyst's perceptual and cognitive knowledge thereby increasing the speed, comprehension, completeness, and correctness applied to complex analytical tasks. Applying structured reasoning techniques to analytical questions helps simplify complex problems and overcomes cognitive biases. By combining visualization with structured reasoning techniques, a user can apply visual thinking to facilitate critical thinking. Users can share and collaborate on their structured reasoning. The software prototype was completed in November 2014 and runs in all major browsers as either a widget within the Ozone Widget Framework or as a stand-alone web application. The software will be distributed to users for evaluation in 2015.



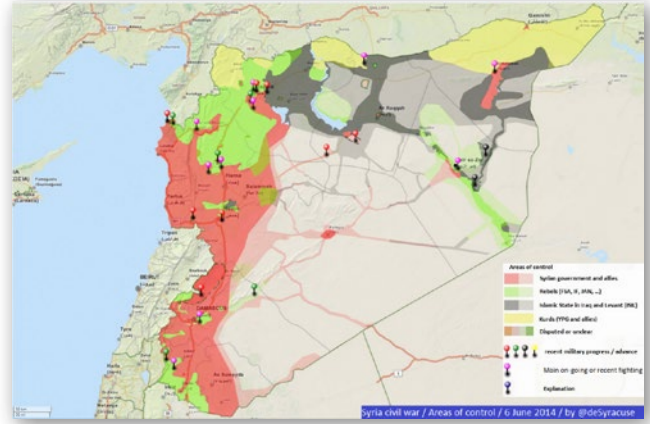


# AAC CURRENT PROJECTS

## Model-Enabled Analysis and Planning

Historically, strategic and operational planners have struggled with creating courses of action (COAs) that result in stable and sustainable outcomes. This challenge is a result of several factors such as collecting and assimilating the specific data needed to characterize the environment, forecasting human behavior and quantifying uncertainties, developing control strategies that mitigate the impacts of uncertainty, assessing non-kinetic outcomes, and incorporating higher order effects throughout the process. The Model-Enabled Analysis and Planning (MEAP) project addresses these issues by using an engineering adaptive control approach known as Model Predictive Control (MPC). MPC is being applied to social science “best of breed” models, theories, and tools which are then applied to the Military Decision Making Process (MDMP).

The iterative and continuous outputs of the system are based on real-time data derived from sources ranging from battlefield reporting to social media which are displayed in a dashboard-like Common Crisis Picture. This dashboard-like feature allows for multiple visualizations and tools relevant to planners, decision makers, analysts, and operators. A workflow and COA builder within the Common Crisis Picture enables planners to forecast potential effects of multiple COAs to the area of operations in order to make faster and better decisions, and assist in aligning and adapting tactical and operational outcomes.



## Visual Analytics Challenge

In an effort to find solutions and expand government outreach and access to the global community, CTTSO has partnered with the Pacific Northwest National Laboratory and the United Kingdom Ministry of Defence to participate in the Institute of Electrical and Electronics Engineers (IEEE) Visual Analytics Science and Technology (VAST) Challenge. The VAST Challenge is an annual international challenge that enables visual analytics researchers and developers to apply their best tools to solve a customized set of problems against a hypothetical scenario and data sets with known ground truth. The VAST Challenge is meant to encourage innovation in visualizing complex data streams including changes in social dynamics, geo-temporal and transaction data at multiple levels of resolution, anomalies, and understanding streaming data. Participants develop and apply visual analytics tools to create solutions, which are then reviewed by a panel of experts for viability and potential future investment by CTTSO or the United Kingdom. Upon completion, the data set used will remain in the public domain for the research community to use beyond the scope of the current challenge.





### Cognitive Counter-Improvised Explosive Device Signature System

The Cognitive Counter-Improvised Explosive Device (C-IED) Signature System (C2IS2) project is part of a larger Joint Improvised Explosive Device Defeat Organization (JIEDDO)-funded effort focused on the development of a C-IED/Attack the Network system. This system analyzes all of the elements of the network to include but not limited to finance, logistics, organization, technical and training support, and special materials needed to support an IED network, and defines the specific data requirements and expected patterns for each of the nodes. The heart of C2IS2 is a network focused, business process model (referred to as the Red Nodal Reference Model) that captures all elements of the adversary's (or Red's) IED related activity. C2IS2 employs this model in four distinct ways: to develop a multi-source fusion-focused collection plan, to support signatures exploitation, to create and examine hypotheses regarding what has been observed, and to characterize Red processes in support of vulnerability assessments and predictive analysis. The second key element of C2IS2 is its comprehensive signatures database and an accompanying analysis tool suite. The database includes hundreds of thousands of IED pertinent signatures while the analysis suite provides tools needed to detect and exploit these signatures within raw collection data. Also, C2IS2 includes a comprehensive, general purpose analysis suite containing tools for spectral analysis, link/social network analysis, text-based analytics, statistical analysis, geo-spatial analysis, and hypothesis creation and vetting.







## AAC MEMBERSHIP

### Intelligence Community

- Office of the Director of National Intelligence

### National Reconnaissance Office

### U.S. Department of Defense

- Defense Intelligence Agency
- Naval Postgraduate School
- Office of the Secretary of Defense (Rapid Fielding Office)
- Office of the Secretary of Defense for Special Operations and Low-Intensity Conflict
- Special Operations Command Central

- U.S. Air Force Special Operations Command

- U.S. Army G-2, G38

- U.S. Army, Special Operations Command

- U.S. Marine Corps, Intelligence Department

- U.S. Naval Special Warfare Group 10

- U.S. Special Operations Command

### U.S. Department of Homeland Security

- Customs and Border Protection, Border Patrol

- Immigration and Customs Enforcement

- Office of Intelligence and Analysis

### U.S. Department of State

- Center for Strategic Counterterrorism Communications
- Conflict and Stability Operations

### White House

- Office of National Drug Control Policy

# CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, AND EXPLOSIVES



# MISSION

Identify, prioritize, and execute research and development projects that satisfy the needs of the interagency combating terrorism community to counter the use of chemical, biological, radiological, nuclear, and explosive materials, and deliver capabilities to the community through rapid research, development, test, and evaluation.

The Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) Subgroup identifies and prioritizes multi-agency user requirements and competitively seeks technological solutions for countering the terrorist deployment of CBRNE materials. Through its participation in the InterAgency Board for Equipment Standardization and Interoperability, and in coordination with the Department of Homeland Security, the National Institute of Justice, the Environmental Protection Agency, and other DoD components, the CBRNE Subgroup integrates technology requirements from the military, fire, hazardous materials, explosives detection, law enforcement, and emergency medical services communities into its process.

# FOCUS AREAS

## **Threat Characterization and Attribution**

Investigate the unique physical and chemical characteristics of threat materials, develop tools to determine the origin of a piece of CBRNE evidence, evaluate clandestine methods of CBRNE production, and assess the effects of decontamination on CBRNE evidence.

## **Consequence Management**

Develop equipment to counter the intentional and unintentional releases of CBRNE materials, to include decontamination and restoration.

## **Information Resources**

Integrate shared information management tools to provide on-scene situational awareness.

## **Protection**

Operationally enhance individual and collective protection performance while reducing cost, and develop decision support tools to allow operators to make protective equipment decisions based on field-generated physiological data.

## **Trace Detection**

Develop enabling technologies to detect threat materials and their precursors at trace levels.

## **Bulk Detection**

Develop enabling technologies to detect threat materials and their precursors at bulk levels.

## **Proximity and Standoff Detection**

Develop enabling technologies to detect threat materials and their precursors at proximity and standoff distances.

***[cbrnesubgroup@cttso.gov](mailto:cbrnesubgroup@cttso.gov)***





## CBRNE COMPLETED PROJECTS

### Tiered Training for Explosive Detection Equipment



Effective deployment and operation of explosives detection technology requires agency personnel and field operators to understand the capabilities and limitations of specific types of devices. Operational hindrances can result from improper selection, purchasing, implementation decisions, deployment location, and misunderstanding of operational procedures. Studio 14b, LLC, located in Safety Harbor, FL, completed the analysis, design, and development of a tiered modular training package for executive/acquisition personnel, technicians, and field operators for ion-mobility spectrometry (IMS) explosive trace detection technologies in use at embassy and vehicle checkpoints, airports, and other sensitive facilities around the world. This computer-based training package builds upon initial familiarity with the equipment and refreshes knowledge and skills following a significant time period without practical application. Training focuses on the basic science of explosive trace detection technology and includes set up, hazards, maintenance, and common troubleshooting techniques and solutions.

### Next Generation Gravity Works Water Purification System

Providing soldiers and other military personnel with potable water is an ongoing challenge and a high priority. Current methods for providing water to military personnel in austere environments are expensive and not always operationally suitable.

Cascade Designs, Inc., located in Seattle, WA, has developed a filter that is capable of providing 360 liters of clean drinking water for a soldier operating in survival mode in a fresh water environment. The filter utilizes the latest in hollow fiber membrane technology and packed bed sorbent media to remove a broad spectrum of microbiological and chemical waterborne contaminants. In addition, the filter does not rely on outside electrical power or manual pumping, and can provide 600 milliliters of clean water per minute. TSWG has fielded 200 units to the Special Operations community for testing and evaluation.





### Spatially Offset Raman Spectroscopy

The detection of materials inside a container allows users to investigate its contents without risk of exposure to hazardous chemical, biological, or explosive materials. Raman spectroscopy allows users to identify molecular-specific signatures of pure compounds and mixtures, making it an ideal candidate for material identification.

Conventional Raman spectroscopy has limitations for through-barrier detection as fluorescence or strong Raman scattering response from the container can mask and cause interference with the weaker Raman signature from the sample, thereby preventing its detection. Spatially Offset Raman Spectroscopy (SORS) circumvents this issue by enabling a Raman spectrum of the sample to be recorded without any prior knowledge of the container's composition.

Cobalt Light Systems, Ltd., in the United Kingdom and Ocean Optics, Inc., in Dunedin, FL developed a compact, light, portable SORS device that can detect materials through non-metallic containers that are opaque, colored, and have a strong spectral signature. A pre-production prototype SORS device was delivered in October 2014.



## CBRNE CURRENT PROJECTS

### Configurable Portable Chemical, Biological, and Radiological Glove Box

Unknown materials suspected to be chemical and biological threat agents are first screened in the field for the presence of explosive, radioactive, and volatile properties before submission to a laboratory for further analysis. MRIGlobal, located in Kansas City, MO, is currently developing a portable glove box (PGB) that is economical, collapsible, and has configurable service ports to allow for field screening of suspected threat agent samples. The PGB is constructed with plastic panels that are welded together to form gas-tight seams, has standard service ports for connection of accessory components and analysis equipment, and includes a service port kit allowing users to place ports of various sizes and types at desired locations. The add-on service ports support the connection of commercial off-the-shelf filters allowing rapid evacuation of air from the PGB for collapse and transport.

Field screening for radioactive isotopes is conducted through the wall of the PGB and detection would normally be limited to beta and gamma particles, as these particles are able to penetrate the PGB wall. However, to allow for alpha particle detection, an alpha-permeable window can be installed on the PGB by the user in the field at the time of sample screening using a custom mount.

### Colorimetric Fabrics for the Detection of Explosive Materials

Colorimetric approaches are valuable in the identification of bulk explosive material. The relatively low-cost method offers excellent sensitivity, portability, and simple operational requirements (no additional power or equipment necessary), enabling rapid deployment in remote areas. However, existing systems require multiple steps by the user and can be time consuming.

In collaboration with the Israel Ministry of Defense, an easy-to-use fabric swab that both collects the sample and detects the presence of explosives in a one-step process is under development. The process uses a "micro-tube" structure/fiber to allow for increased sampling efficiency and integrated detection capabilities within the swab. The increased sampling efficiency comes from the characteristics of the fiber's outer material which is "sticky" and rough, thereby capturing an increased number of explosives particles. The integrated detection capabilities come from the integration of colorimetric chemistry reagents within the electro-spun fiber structure. The integrated reagents allow for colorimetric chemical reactions to occur in the swiping process as the pressure of swiping a surface releases the microliter levels of reagents which produce a color change when the swab



comes in contact with the threat materials. Prototype swabs have been demonstrated for nitroaromatics (e.g., TNT), nitrates (e.g., ammonia nitrate, urea nitrate), nitroamines (e.g., RDX), and chlorates/perchlorates (e.g., potassium chlorate, potassium perchlorate). These swabs, with all the colorimetric chemistries contained within, will minimize the logistics footprint and maximize user safety (i.e., no physical contact with chemicals). Tel Aviv University is in the process of licensing the technology to a commercialization partner.

### Low Cost Raman for Threat Material Identification

Raman spectroscopy is uniquely suited for emergency response applications where it is necessary to identify an unknown material. In cooperation with CTTSO and the United Kingdom, Snowy Range Instruments, located in Laramie, WY, is developing a low cost, pocket-sized Raman device that can identify a range of chemical and energetic materials. A major area of cost saving is the use of a consumer product laser (e.g., from a compact disk player) which is considerably cheaper due to volume production. Also, the effect of the laser and the system algorithms will be designed and developed specifically to ensure validity of results. The target price for this device is in the \$5,000 range. Due to its reduced cost and size, it will be widely used in specialized operations and site-specific exploration, and support departments with limited budgets.



### Next Generation Chemical and Biological Sock

North Carolina State University and Lion Apparel, Inc., located in Dayton, OH, are developing a next generation chemical and biological (CB) sock which provides National Fire Protection Association (NFPA) 1994, Class 3 protection while worn under normal combat or tactical footwear. The sock system is capable of being worn unobtrusively and will provide enhanced comfort compared to current CB socks.

The new sock will provide an additional layer of percutaneous protection to the feet in the event the outer boot is compromised, while improving fit, sizing, and overall user comfort. The CB sock will still provide extended mission percutaneous protection from exposure to the harmful effects of all traditional CB warfare agents and the toxic industrial chemicals listed in NFPA 1994.



### Handheld Mass Spectrometer

Mass spectrometry is the gold-standard analytical lab technique for the analysis of unknown chemicals. Its sensitivity and selectivity have the potential to allow users in the field to detect a wider range of targets with a lower “false alarm”

rate than current IMS systems. However, the most portable mass spectrometers are 35 to 40 pound units that take several minutes for analysis and require attendant experts in sampling and system operation.

908 Devices, Inc., located in Boston, MA, is developing a lightweight trace solid/liquid detection and identification platform for explosive materials. While most conventional mass spectrometers use ion traps approximately the size of a soda can and require large turbo pumps, the handheld mass spectrometer will use a high-pressure micro-ion trap array approximately the size of a quarter. By reducing the size of the ion-trap, the path of the ions is shorter; therefore, the system can operate at near ambient pressures and rely on much smaller and more durable pumps while maintaining good resolution. The device will be less than seven pounds, have a resolution of at least one atomic mass unit, and will display results in an easy-to-use interface that allows operators with a range of technical skills to use the device.



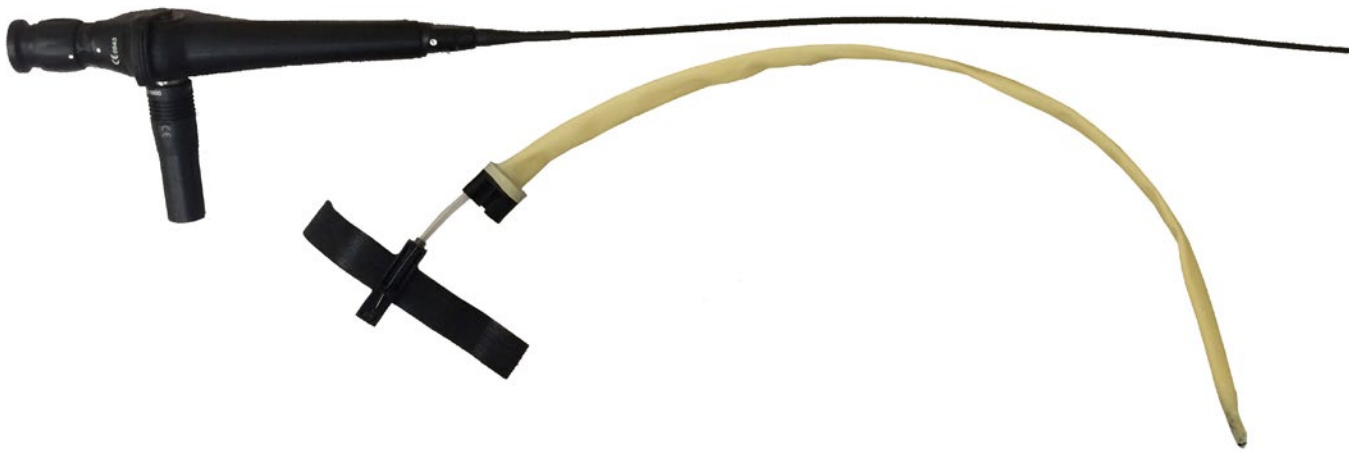




### Endoscopic Chemical and Biological Collector

There are many operational scenarios where a chemical and biological (CB) agent may be present, but the collection methods required to determine the presence or absence of a CB agent may be difficult. Various physical barriers, such as drop mailboxes or closed rooms, may limit the ability to collect samples without opening the potentially contaminated area and exposing the surrounding area and personnel to the agent.

The Bode Technology Group, Inc., located in Lorton, VA, is developing an endoscopic CB collection tool with a manipulator to facilitate access into tight spaces. After the sample is collected, it is sealed to protect sample integrity and then retracted from the collection area in a manner that minimizes the risk of exposure to the surrounding area and the individual who performed the collection.





## CBRNE MEMBERSHIP

### Environmental Protection Agency

### Federal Reserve Board

### Intelligence Community

### InterAgency Board

### National Security Agency

### State and Local Law Enforcement

- Arlington County (VA) Fire Department
- Fairfax City (VA) Fire Department
- Fairfax County (VA) Fire and Rescue Department
- Fairfax County (VA) Police Department
- New York City Fire Department
- New York City Office of Chief Medical Examiner
- New York City Police Department
- Northern Illinois Police Alarm System
- Seattle (WA) Fire Department

### U.S. Capitol Police

### U.S. Department of Agriculture

- Animal and Plant Health Inspection Service
- Food Safety and Inspection Service

### U.S. Department of Commerce

- National Institute of Standards and Technology

### U.S. Department of Defense

- Acquisition, Technology, and Logistics
- Defense Advanced Research Projects Agency
- Defense Intelligence Agency
- Defense Threat Reduction Agency
- Joint Chiefs of Staff
- Joint Improvised Explosive Device Defeat Organization
- Joint Program Executive Office for Chemical and Biological Defense

- Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense
- Pentagon Force Protection Agency
- Special Operations Command
- U.S. Air Force Air Combat Command
- U.S. Army
  - 20th Support Command, CBRNE
  - 22nd Chemical Battalion
  - Armament Research, Development, and Engineering Center
  - Chemical, Biological, Radiological, and Nuclear School
  - Medical Department
  - National Ground Intelligence Center
  - Research, Development, and Engineering Command, Edgewood Chemical Biological Center
- U.S. Marine Corps
  - Chemical Biological Incident Response Force
  - Explosive Ordnance Disposal
  - Systems Command
- U.S. Navy
  - Bureau of Medicine
  - Naval Air Warfare Center
  - Naval Explosive Ordnance Disposal Technology Division
  - Naval Forces Central Command
  - Naval Research Laboratory
  - Naval Surface Warfare Center

### U.S. Department of Energy

- National Nuclear Security Administration

### U.S. Department of Health and Human Services

- Centers for Disease Control and Prevention
- Food and Drug Administration
- National Institute for Occupational Safety and Health

### U.S. Department of Homeland Security

- Federal Emergency Management Agency
- Federal Protective Service
- Office of Health Affairs
- Science and Technology Directorate
- Transportation Security Administration
- Transportation Security Laboratory
- U.S. Coast Guard
- U.S. Secret Service

### U.S. Department of the Interior

- National Park Service, United States Park Police

### U.S. Department of Justice

- Bureau of Alcohol, Tobacco, Firearms and Explosives
- Federal Bureau of Investigation
- National Institute of Justice
- U.S. Marshals Service

### U.S. Department of Labor

### U.S. Department of State

- Bureau of Arms Control, Verification, and Compliance
- Bureau of Counterterrorism
- Bureau of Diplomatic Security
- Bureau of Overseas Buildings Operations

### U.S. Department of Transportation

- Research and Innovative Technology Administration (Volpe Center)

### U.S. Senate Sergeant at Arms

### Virginia Department of Emergency Management

### Virginia Department of Transportation

### White House

- Homeland Security Council
- Office of Science and Technology Policy



THIS PAGE  
INTENTIONALLY  
LEFT BLANK



## IMPROVISED DEVICE DEFEAT



# MISSION

Identify, prioritize, and execute projects that satisfy mission critical needs and address interagency requirements for advanced technologies to safely and effectively defeat improvised terrorist devices.

The Improvised Device Defeat (IDD) Subgroup delivers advanced technologies, tools, and information to increase the operational capabilities of the U.S. military Explosive Ordnance Disposal (EOD) community and federal, state, and local bomb squads to defeat and neutralize terrorist devices. In collaboration with military, federal, state, and local agencies, the IDD Subgroup identifies and prioritizes multi-agency user requirements through joint working groups and thorough validation processes.

# FOCUS AREAS

## Access and Diagnostics

Develop reliable, precise, and cost-effective advanced technical solutions and procedures to improve military and civilian bomb squad technicians' diagnostic analysis of improvised explosive devices (IEDs). Develop and improve technologies that identify and locate the IED, explosive or enhanced fillers, and key fuzing and firing components. Develop testing methodologies and protocols that define and confirm the access, diagnostic tool, or procedure's ability to satisfy expected design and operational parameters.

## Device Defeat

Develop advanced technologies to defeat the broad spectrum of improvised terrorist devices including IEDs, vehicle-borne improvised explosive devices (VBIEDs), person-borne IEDs (PBIEDs), and enhanced hazard devices containing chemical, biological, or radiological materials. Develop innovative, cost-effective disruption and precision render-safe solutions that increase standoff distance, reduce collateral damage, and decrease risk to the improvised device defeat operator. Improve neutralization techniques for both sensitive and insensitive explosives and enhanced payloads such as flammable liquids and gases.

## Emerging Threats

Advance production of effective countermeasures to neutralize or defeat radio-controlled IEDs and provide safe environments for improvised device defeat operators. Develop, characterize, and test technology solutions to effectively render safe improvised devices using novel fuzing systems that incorporate such items as electronic sensors, micro-controllers, or mechatronic<sup>1</sup> components.

## Remote Procedures

Develop advanced application systems to remotely access, diagnose, and defeat improvised devices. Advance the development of manufacturer- and model-independent products and robotics with plug-and-play interfaces. Develop an open architecture, navigation, communication, and operator controls for robotic platforms, tools, and sensors. Develop advanced application systems to remotely access, diagnose, and defeat improvised devices.

## Tool Characterization and Information Resources

Improve performance evaluation methodologies, test procedures, and tool characterization models for improvised device defeat technologies. Conduct ongoing evaluation and improvement of tools, methods, and protocols for confirming the accuracy of detection equipment, reliability of diagnostic tools, and completeness of neutralization and render safe techniques. Advance training concepts and information delivery systems that promote the tactical operational response readiness required to effectively, safely, and efficiently counter improvised devices and emerging threats.

[iddsubgroup@cttso.gov](mailto:iddsubgroup@cttso.gov)

---

<sup>1</sup>Mechatronics adds intelligence to a mechanical design or replaces a mechanical design with an intelligent electronic solution. An example of a mechatronic component is the digital thermostat, which has replaced the much more inefficient mechanical thermostat. Digital thermostats are more accurate and are typically programmable, allowing for increased efficiency.



## IDD COMPLETED PROJECTS

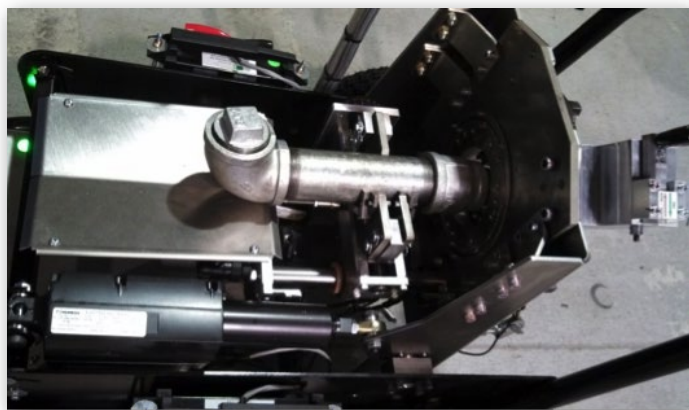


### Automatic Wire Cutter

The Automatic Wire Cutter (AWC) provides the Explosive Ordnance Disposal (EOD) and Public Safety Bomb Squad communities the ability to conduct safe, effective, and remote operations with its reusable, lightweight, non-explosively initiated cutter. Safe stand-off protection is provided by a mechanical timer with two settings (30 and 120 seconds), which gives the operator time to place the cutter and retreat a safe distance before the ceramic blade cuts the command or trip wire. The AWC is commercially available from RE2, Inc.

### Semi-Autonomous Pipe Bomb End-Cap Removal Tool

The Semi-Autonomous Pipe Bomb End-Cap Removal (SAPBER) tool is a non-explosive tool that provides bomb technicians with the capability to remotely disassemble pipe bombs, grenades, and other ordnance that continue to be a significant threat to public safety bomb squads around the country. The SAPBER tool preserves the explosive powder, firing train, detonator, and batteries (the key components of any pipe bomb), all of which are invaluable evidence to the bomb squad seeking to apprehend the bomb maker. The SAPBER tool is commercially available from RE2, Inc.



### Vehicle-Borne Improvised Explosive Device Toolkit Upgrade

The IDD Subgroup upgraded the Vehicle-Borne Improvised Explosive Device (VBIED) Toolkit to include eight additional items. The VBIED Toolkit consists of various tools to effectively interrogate a VBIED using a robotic platform. The upgraded kit consists of 13 items including an extender gripper (short, long, and angled extensions), an electrical jack, a window punch with spring door opener, a window punch and door opener for older style vehicles, a rake and hoe, and a wireless camera. The bomb technician assesses the situation to determine which tool to place on the robotic platform before sending it downrange to perform the action necessary to gain entry into the vehicle. The VBIED Toolkit has been evaluated by the Michigan State Police Bomb Squad and the National Assessment Group to ensure that these tools meet end user needs.







## IDD CURRENT PROJECTS

### Rapid Bomb Neutralization: Humpty Dumpty

Since the 1970s, when the first projected water-jet charge disruptors were developed to render safe explosive devices, disruptor technology and applications have continuously evolved. Two fundamental requirements continue to drive new innovations—the need to effectively neutralize or destroy threat devices while at the same time protecting the operator during the render safe procedure.

CTTSO, in partnership with the Israel Ministry of Defense, is developing a dynamic shaped charge disruptor capable of destroying or neutralizing an IED from a safe distance. The Humpty Dumpty disruptor is designed to be lightweight, low cost, remotely deployable, and disposable. The bomb technician, through a radio-controlled interface, can remotely operate the Humpty Dumpty's pan-and-tilt camera and laser pointer to position the shaped charge to neutralize an IED most effectively. The system can operate on a wide variety of ground types and under common environmental conditions. The next generation Humpty Dumpty is designed to be reusable, and will incorporate a commercially available and lightweight disruptor to further increase aiming precision and versatility.



### Southwest Border Counter-Improvised Explosive Device Working Group

The primary goal of the Southwest Border Counter-Improvised Explosive Device Working Group (SWB C-IED WG) is to study and provide solutions for the unique operating environments in the border area of responsibility (AOR). The IDD Subgroup works in partnership with state and local bomb squads which operate along the U.S.-Mexico border and have an international Port of Entry in their AOR. The WG brings border bomb squad technicians together to discuss the current threat in their AOR, the types of devices being encountered, and the tools and equipment they are using. The WG also serves as a forum for border bomb squad technicians to share their tactics, techniques, and procedures. The most recent WG meeting was hosted by the Dona Ana County Sheriff's Department in Las Cruces, NM. A Mexican National team attended and briefed on current threats in Mexico.





## IDD MEMBERSHIP

---

### Intelligence Community

#### National Bomb Squad Commanders Advisory Board

#### State and Local Law Enforcement

- Arizona Department of Public Safety (Western Region)
- Delaware State Police (Eastern Region)
- Fairfax County (VA) Police Department
- Houston (TX) Police Department (Central Region)
- Maryland State Police
- Michigan State Police
- Pittsburgh (PA) Bureau of Police
- South Carolina Law Enforcement Division (Southern Region)

#### U.S. Capitol Police

#### U.S. Department of Defense

- Pentagon Force Protection Agency Bomb Squad

#### U.S. Air Force

- Air Combat Command
- Explosive Ordnance Disposal Technical Detachment (AFCEC/CXE)

#### U.S. Army

- 52nd Ordnance Group
- Explosive Ordnance Disposal Technical Detachment

#### U.S. Marine Corps

- Chemical Biological Incident Response Force
- Explosive Ordnance Disposal Detachment

#### U.S. Navy

- Explosive Ordnance Disposal Fleet Liaison Office
- Explosive Ordnance Disposal Technology Division

### U.S. Department of Homeland Security

- Border and Transportation Security Directorate
- Homeland Security Advanced Research Project Agency
- Office for Bombing Prevention
- Science and Technology Directorate
- Transportation Security Administration
- U.S. Coast Guard
- U.S. Secret Service

### U.S. Department of Justice

- Bureau of Alcohol, Tobacco, Firearms and Explosives
- Federal Bureau of Investigation
- National Institute of Justice
- U.S. Marshals Service



THIS PAGE  
INTENTIONALLY  
LEFT BLANK

# INVESTIGATIVE AND FORENSIC SCIENCE





# MISSION

Identify, prioritize, and execute research and development projects of multi-agency interest that provide investigative and forensic support to terrorist related counteraction, investigations, and analysis.

The Investigative and Forensic Science (IFS) Subgroup executes wide-ranging research and development to advance investigative and forensic science. The subgroup focuses on crime scene response, criminalistics, electronic evidence (i.e., multimedia forensics), forensic intelligence, and identity knowledge. The IFS Subgroup works with a diverse group of international, federal interagency, and select state/provincial/municipal law enforcement, investigative, forensic science, and forensic intelligence stakeholders as well as partners in the DoD and intelligence community to produce advanced and new technology and methods that improve mission capabilities for combating terrorism. The subgroup strives to be groundbreaking, relevant to combating terrorism, and vital to the Defense Forensic Enterprise system.

# FOCUS AREAS

## **Crime Scene Response**

Improve the quality of recognition, documentation, collection, and preservation of evidence as well as the safety of first responders at a scene. Improve the capability of first responders and forensic examiners to process and record terrorist incident scenes for future prosecution.

## **Criminalistics**

Advance the capability to identify and evaluate physical evidence by the application of physical and natural sciences and technology. Improve the efficiency and speed of the analysis and evaluation of physical evidence and the reporting of results to end users. Develop new and more efficient forensic capabilities.

## **Electronic Evidence**

Develop computer forensic hardware, software, decryption tools, and digital methods to investigate terrorism. Identify computer systems and media used by terrorists and acquire the maximum amount of evidence from them. Develop advanced methods to extract and enhance audio recordings from surveillance sources. Improve techniques for the analysis of electronic devices to obtain the most forensic information.

## **Forensic Intelligence**

Develop advanced multi-disciplinary forensic and scientific techniques to perform sensitive site exploitation and process incident response scenes to acquire, collate, analyze, and disseminate law enforcement and tactical actionable intelligence and information. Develop improved interrogation, interviewing, and credibility assessment methods. Improve related technical surveillance methods.

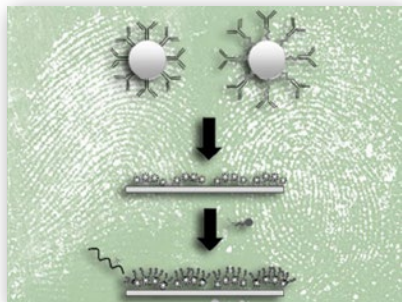
## **Identity Knowledge**

Develop new scientific technology for the specific identification of individuals who have committed, or are associated with, terrorist acts. Improve the capability to use physical evidence to individualize or classify subjects or persons of interest.

*[ifssubgroup@cttso.gov](mailto:ifssubgroup@cttso.gov)*



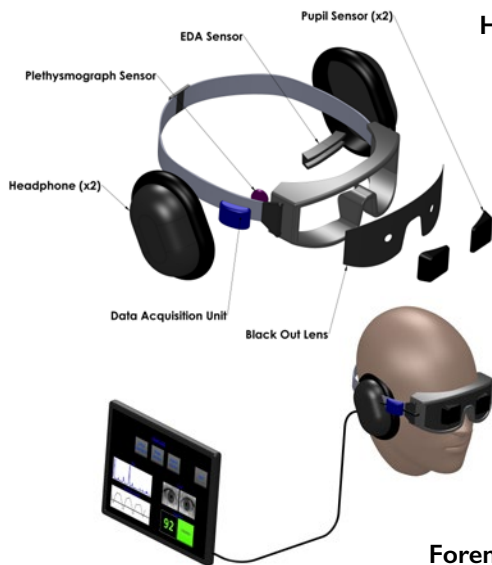
## IFS COMPLETED PROJECTS



### Immunogenic Fingerprint Reagents

Under a bilateral agreement between CTTSO and the Defence Science and Technology Organisation, Australia, and through research work carried out by the University of Technology, Sydney, a non-traditional latent fingerprint detection method has been developed and validated based on novel antibodies and nanotechnology. This process involves new antigenic reagents targeting other chemicals commonly found in latent

fingerprints, such as carbohydrates, fatty acids, sterols, and proteins. It improves selectivity and sensitivity of fingerprint detection compared to existing methods and is compatible with standard laboratory equipment and existing processing sequences.

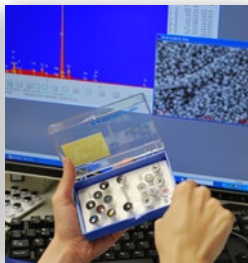


### Head Mounted Credibility Assessment Screening System

Personnel from the U.S. military, law enforcement, and intelligence communities required a credibility assessment screening system for their combating terrorism operations that is accurate, efficient, and has a low inconclusive rate. Additionally, the system needed to be quick and easy to use and require a minimal amount of training to operate. Current systems require too much time to operate, have high inconclusive rates, and require too much training to adequately employ for many missions. In an effort with Azimuth, Inc., located in Morgantown, WV, the Head Mounted Credibility Assessment Screening System (HMCASS) was developed to improve credibility assessments during interrogations. During an interrogation, the system monitors a person's pulse and electro-dermal activity, and also monitors changes in the pupil diameter of the person's eye. The signals are analyzed by a processing unit which provides a real time credibility assessment of the person. The device consists of a headset apparatus that fits on the person's head and connects to a separate processing unit by a cable.

### Forensic Ink Analysis and Comparison System

Since terrorists often use fraudulent and counterfeit documents, forensic document analysis contributes significantly to identifying terrorists and their networks. Analysis of the ink in potentially fraudulent documents can link the documents to individual terrorists, their networks, specific incidents, and locations.

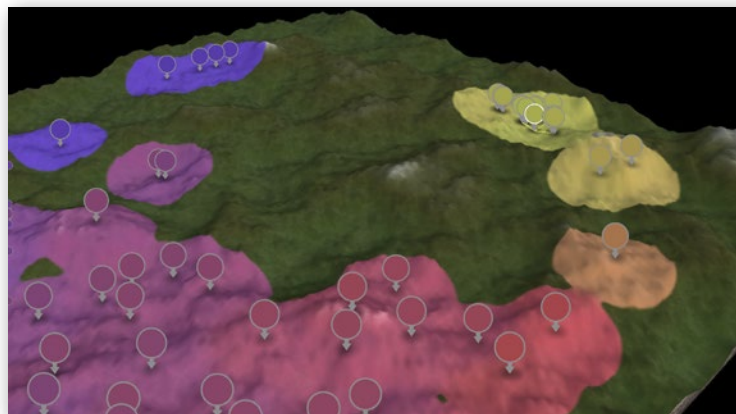


Florida International University has developed an automated identification and analysis system for inks from copiers, inkjet printers, and traditional print ink media using multi-discipline scientific techniques based on chemical and physical traits. The system compares the traits to those in a database and matches or eliminates the ink from others to determine if documents are fraudulent or genuine.



## Comparative Analysis of Material from Homemade Explosives and IEDs

During investigations of explosions or when unexploded homemade explosives (HMEs) and improvised explosive devices (IEDs) are found, determining the source of the materials used in the HME or IED provides valuable investigative information and could link the HME or IED to other events, sources, and geographic regions. Isotope ratio determinations and trace metals may provide valuable information in several different types of forensic applications and have been employed in some explosive related analysis in the past. Flinders University in Adelaide, Australia, has demonstrated the capability to analyze materials and residues from HMEs/IEDs and compare them to other HME/IED residues for event-to-event linking. The project also includes a map and searchable database with isotopes, ratios, and trace metals on an event-to-source and source-to-region basis to determine the most likely geographic origin of materials or residue from HMEs/IEDs.



## IFS CURRENT PROJECTS

### Rapid Field Deployable DNA Profiler

DNA profiling is one of the most powerful forensic techniques available. With the growth of DNA databases around the world, the ability to collect, identify, isolate, and analyze DNA samples for profiling has become quicker, most efficient, and more encompassing. Because DNA analysis still takes place primarily in the lab, systems that provide reliable and accurate profiling in the field are needed, especially in geographically isolated areas. The implementation of these systems along with the growing databases of DNA profiles will allow operators on the ground to quickly assess a scene for an individual's presence. When DNA is collected for analysis, it requires preservation and packaging so it can be shipped to a crime lab for complete analysis. LGC, Ltd., located in the United Kingdom, is building upon their current ParaDNA instrument by incorporating lyophilization (i.e., freeze-drying) and separation techniques in order to allow for a more complete analysis in the field and reduce the delay associated with sending samples back to the lab. Their goal is to achieve stability of unrefrigerated reagents for three months, and to ensure preservation of the remaining test sample to allow confirmatory analysis through the standard laboratory process.



### DNA Methodology to Geo-Source Heroin

The production and sale of heroin is a huge source of revenue for terrorist organizations and criminal enterprises which is used to fund their illegal and violent activities. The seizure of heroin often occurs far away from where it was grown and processed. Knowing its geographic location of origin provides powerful intelligence to law enforcement and counterterrorist forces. With the advent of sophisticated DNA technology, it is now possible to extract DNA from samples of heroin,





amplify it, and then create a DNA profile. The profiles can be compared to other profiles of known samples to determine the geographic location where the heroin was grown. SRC, Inc., located in Syracuse, NY, in conjunction with Syracuse University is developing a scientifically validated forensic method to extract DNA from heroin samples and determine the location of origin. The procedures will identify simple sequence repeats (SSR) and single nucleotide polymorphism (SNP) that show individual traits of the DNA, and those traits will be compared to reference files of known heroin DNA samples from geographic regions around the world.

### DNA Radar System

DNA is typically processed for individualization based on the standard 13 core loci (sites on chromosomes). Additional information can be obtained from loci as well as mitochondrial DNA. By examining many other loci, the potential to identify ethnic and familial traits is increased. Kailos Genetics, Inc., located in Huntsville, AL, is in the process of developing a DNA Radar System. The system will harness a powerful sample preparation technique that enables multiplexing of a large number of genetic regions for high throughput sequencing in minute amounts of DNA. The data will be processed by a series of algorithms built on the most advanced DNA profiling technology to extract investigating leads from the sample. The procedures and techniques developed in this project will be able to extract identifiable information about donors of unknown DNA samples even when the donor's profile does not exist in a DNA database. The DNA Radar System will allow for the extraction of traditional identification markers for compatibility with current databases including CODIS and ENFSI, inference of surnames from male samples, revelation of ancestry information, and also allow for the determination of phenotypic information (e.g., observable characteristics such as eye color and hair color, as well as blood type predictions).



### Best Practices for Expeditionary Forensics

Since the start of military missions in Iraq and Afghanistan, the U.S. military and its coalition partners have conducted extensive expeditionary forensic operations. These operations have spanned the entire range of forensic technologies and have involved onsite support as well as reach back capabilities. Support has been provided by multiple agencies including some from foreign and U.S. coalition partner nations. In some cases, small portable laboratory modules were produced and transported to the theater of operations. In other cases, forensic equipment was moved to the site and operations were set up in tents or other semi-permanent facilities. Many of the efforts and procedures were conducted by trial and error. With no central agency overseeing all of the forensic expeditionary operations, no one person or organization knows what actions have been attempted,

accomplished, or were successful. A project has been initiated with the Center for Naval Analyses, located in Arlington, VA, to produce a comprehensive best practice for expeditionary forensics. The resource will encompass forensic expeditionary missions, capabilities, and services which were provided during the military operations in Iraq and Afghanistan from 2003 to 2014.







# IFS MEMBERSHIP

## Environmental Protection Agency

- National Enforcement Investigations Center

## Federal Reserve Board

## Intelligence Community

## National Forensic Science Technology Center

## National Media Exploitation Center

## National Transportation Safety Board

## U.S. Department of Commerce

- National Institute of Standards and Technology, Office of Law Enforcement Standards

## U.S. Department of Defense

- Component Commands
- Defense Advanced Research Projects Agency
- Defense Computer Forensics Laboratory
- Defense Cyber Crime Institute
- Defense Forensic Enterprise, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics
- Defense Forensic Science Center
- Defense Forensics and Biometrics Agency
- Defense Intelligence Agency
- Defense Threat Reduction Agency

- Headquarters, U.S. Marine Corps
- Intelligence Systems Support Office, Office of the Under Secretary of Defense for Intelligence
- Joint IED Defeat Organization
- National Center for Credibility Assessment
- National Geospatial Intelligence Agency
- Naval Research Laboratory
- Office of the Provost Marshal General
- Pentagon Force Protection Agency
- U.S. Air Force Office of Special Investigations
- U.S. Army Criminal Investigation Command
- U.S. Navy Naval Criminal Investigative Service
- U.S. Special Operations Command

## U.S. Department of Energy

- Office of Environment, Health, Safety, and Security
- Office of Inspector General

## U.S. Department of Health and Human Services

## U.S. Department of Homeland Security

- Customs and Border Protection
- Federal Emergency Management Agency
- Federal Protective Service

- Homeland Security Investigations Forensic Laboratory
- Immigration and Customs Enforcement
- Transportation Security Administration
- Transportation Security Laboratory
- U.S. Secret Service

## U.S. Department of Justice

- Bureau of Alcohol, Tobacco, Firearms and Explosives
- Drug Enforcement Administration
- Federal Bureau of Investigation
- National Institute of Justice
- U.S. Marshals Service

## U.S. Department of State

- Bureau of Counterterrorism

## U.S. Department of Transportation

- Federal Aviation Administration

## U.S. Department of Veterans Affairs

## U.S. Postal Inspection Service

# IRREGULAR WARFARE AND EVOLVING THREATS



# MISSION

After the U.S. military departs Afghanistan, it will be challenged by emergent global threats different from and more capable than the insurgent forces it has encountered in the past decade. Mobile, dispersed warfare will be the dominant form of combat and will include more than Tier 1 insurgencies (i.e., Iraq and Afghanistan) whose capabilities, while deadly, are relatively confined to light infantry tactics, IED employment, and small arms engagements. U.S. Forces face a threat environment where irregular, state-sponsored, and non-state hybrid and conventional adversaries armed with easy to employ precision weapons, global surveillance, and networking will have the capability to undercut the operational and technical superiority of U.S. Conventional and Special Operations Forces (SOF). These shifts in the global security paradigm will progressively blur the boundaries between conventional and irregular warfare. Offering foresight about disruptions of this nature through rapid, adaptive demonstration of draft operational concepts so that concept developers can explore new design models before a conflict begins must be a primary goal.

The Irregular Warfare and Evolving Threats (IW/ET) Subgroup will develop new concepts and capabilities for warfighters and interagency partners who are confronting the complexity of the current operational environment, while simultaneously looking outward rather than inward to appropriately size, shape, and develop their forces. In accordance with the Quadrennial Defense Review's (QDR) emphasis on preparation to defeat adversaries and succeed in a wide range of contingencies, IW/ET engages in operational assessment, concept development, and independent validation of unique prototype capabilities to identify, confront, and defeat evolving threats.

# FOCUS AREAS

## **Advanced Influence and Information Capabilities**

Conduct research, operational analysis, capability design, and implementation support to develop new tools, techniques, and activities that enable our forces to influence, disrupt, corrupt, or usurp the decision making of adversaries and potential adversaries within the physical, information, or cognitive domains of the information environment.

## **Counter-Network Concepts and Capabilities**

Conduct research, analysis, and development of new concepts and capabilities that integrate unique skill sets of combined U.S. military, SOF, interagency, and international partners to identify and interdict threat networks and enterprises.

## **Partnership Capacity Development**

Conduct research, operational analysis, capability design, and implementation support in order to more effectively assist, train, advise, and influence foreign partners, foreign competitors, adversary leaders, and relevant populations in support of expeditionary, low-cost, small-footprint operations in the land, maritime, and cyber domains.

*[iwetsubgroup@cttso.gov](mailto:iwetsubgroup@cttso.gov)*



## IW/ET CURRENT PROJECTS



### CICERO

The Cicero project focuses on identifying technologies and doctrine that can be used to support the four principles of the U.S. Army's Village Stability Operations and the Department of Homeland Security/Immigration and Customs Enforcement community stability approach—Shape, Hold, Build, and Transition. This project will develop a low-cost, efficient, and effective method of creating or extending local security, sustainable governance, and protection from terrorism in small and large urban environments. Through relevant doctrine, training, technology, and innovative partnerships, this project will facilitate dialogue and information sharing to promote resilience and resistance in the face of armed violence. Also, it will develop a secure yet unclassified platform to test and evaluate tools, techniques, and procedures for use in “ungoverned” or “under-governed” urban environments.



### Conflict Zone Toolkit

The Conflict Zone Toolkit is designed to offer U.S. and partner nation law enforcement, diplomatic, military, and development agencies the tools, technology, and connectivity required to carry out their assigned missions and responsibilities within areas that are “at risk” (i.e., fragile or failed states) or active conflict zones. The goal of this project is to develop a suite of capabilities that can be quickly deployed to assist decision makers and field personnel to better understand and address unexpected crises or rapidly evolving situations that pose a significant threat or terrorist attack. The Conflict Zone Toolkit will also enable U.S. interagency and international partners to capture, compile, verify, vet, and view information in a timely manner, and preserve its evidentiary value for use in a U.S., United Nations, or international proceeding.

### Lawfare

Law is becoming an increasingly important element of international conflicts. In 2001, Major General Charles Dunlap, Jr. coined the term “lawfare” to describe the strategy of “using or misusing law as a substitute for traditional military means to achieve an operational objective.” Several developments have made the use of international law an increasingly powerful weapon in 21st Century conflicts. Various adversaries and potential adversaries of the U.S. including terrorist groups, their state sponsors, and China, have used law in recent years as a substitute for traditional military means to advance operational objectives.

This project's primary goal is two-fold: to develop specific, broadly applicable options on how the U.S. can more effectively counter the use of lawfare by sub-national groups against the U.S. and its allies, and how the U.S. can most effectively use lawfare to disrupt, degrade, and where possible, dismantle illicit and other sub-national groups.







## IW/ET MEMBERSHIP

### Intelligence Community

#### U.S. Department of Defense

- U.S. Marine Corps

### U.S. Department of Homeland Security

- Immigration and Customs Enforcement

### U.S. Department of State





The image is a collage. The top left shows riot police in helmets with clear visors. The top right features a large, white and black humanoid robot with a camera for a head. The bottom left depicts soldiers in camouflage uniforms and helmets, some crouching and aiming weapons. The bottom right shows tactical soldiers in blue uniforms and helmets, also aiming weapons. A semi-transparent grey banner with the text 'PERSONNEL PROTECTION' is centered across the middle.

## PERSONNEL PROTECTION

# MISSION

Identify, prioritize, and execute research and development projects that satisfy interagency requirements to provide advanced tools, techniques, and guidelines that enhance personnel security.

The Personnel Protection (PP) Subgroup develops new equipment, reference tools, and standards to improve the protection of high risk personnel (HRP). Projects focus on putting innovative tools such as automated information management systems, communication devices, and mobile surveillance systems, as well as personnel and vehicle protection equipment in the hands of those tasked with the safety of HRP. The subgroup delivers new technologies to military, federal, state, and local law enforcement agencies. The PP Subgroup is co-chaired by representatives from the Department of Energy and the Department of State.

# FOCUS AREAS

## **Communications, Surveillance, and Reconnaissance**

Develop technologies that provide military and law enforcement personnel with a greater capability of covertly communicating and collecting surveillance data to identify and mitigate terrorist threats against personnel. Provide tools to tag, track, and locate mission critical personnel. Develop technology that enhances situational awareness of mission operations.

## **Individual Protection and Survivability**

Enhance the protection of personnel during blast and ballistic events. Develop technologies that increase the performance of body armor by reducing weight and optimizing material performance. Develop test devices and procedures that provide more biofidelic responses during blast and ballistic testing events in order to mitigate the probability of personnel injury. Quantify the effects of conventional and enhanced blast damage mechanisms to the body.

## **Information Resources**

Develop reference materials, information management systems, and analytical tools to enhance mission preparation, facilitate decision making, and improve incident response capabilities. Automate software tools to more efficiently exploit intelligence and surveillance data. Generate tools that will augment the detection of networks, relationship resolution, and tracking terrorists through large amounts of data.

## **Mobile Security**

Enhance personnel security during vehicular, marine, and air transportation. Develop techniques to increase protection against blast and ballistic threats during transit. Conduct performance evaluations and studies to assess the protection capabilities of transport mechanisms, and generate solutions to optimize protection.

**[ppsubgroup@cttso.gov](mailto:ppsubgroup@cttso.gov)**



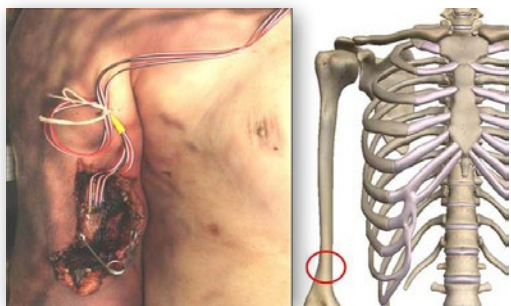
## PP COMPLETED PROJECTS

### Light Armored Hybrid Sport Utility Vehicle



With the recent advances in hybrid vehicle technologies, agencies that provide protection to senior leaders seek armored vehicles that are more fuel efficient for use by protective details. The added weight of the hybrid system reduces the payload capacity and performance of the vehicle. Innovative solutions were sought to provide armored, alternative fuel vehicles for use as prospective vehicles for high risk personnel (HRP). The vehicles of interest were 2013 American manufactured commercial models, six passenger minimum, hybrid or electric sport utility vehicles, which for this effort, were represented by the 2013 Chevrolet Tahoe Hybrid. Hardwire, LLC, located in Pocomoke City, MD, used innovative methods and materials to provide National Institute of Justice (NIJ) Level III ballistic

protection to the occupant compartment. The solution did not exceed the manufacturer's Gross Vehicle Weight (GVW) specification. The vehicles were required to meet the same U.S. Department of Transportation (DOT), Federal Motor Vehicle Safety (FMVS), and Original Equipment Manufacturer (OEM) performance and safety standards as the currently used armored gasoline engine vehicles. The design used limited modifications to the vehicle's suspension and braking systems to ensure safe operation and handling as outlined in the DOT, FMVS, and OEM standards. The light armor solution installed on the hybrid Tahoe was delivered to the Government to undergo government armored vehicle testing to verify and validate design performance.



### Massive Projectile, Whole Body Displacement Blast Injury Model

During large blast attacks on vehicles, ships, buildings, and structures, a significant source of personnel injuries is a result of blunt trauma caused by massive projectile impacts or acceleration of unsecured individuals into rigid bodies such as walls, ceilings, floors, or equipment. Applied Research Associates, Inc., located in Littleton, CO, has created a model to quantitatively characterize the nature and severity of these types of injuries in sufficient detail to quantify weapon effects, predict incapacitation, and anticipate medical response requirements and outcomes. They have validated existing injury criteria and developed new injury criteria to address

whole body blunt impact injury mechanisms. Specifically, this model quantitatively characterizes the nature and severity of injuries caused by 15 to 1,000 pound projectiles impacting personnel at velocities less than 200 miles per hour, incorporating both the acceleration and deceleration aspects of whole body displacement. The model was developed through extensive testing using instrumented post mortem human surrogates and appendages. Data analysis yielded not only injury thresholds, but also full risk functions. The resulting model is suitable for use in an engineering code and is capable of operating in a stand-alone mode as well.

### Multi-Functional Earpiece

Hearing injuries decrease troop readiness and negatively impact a soldier's performance during service as well as lead to a future reduction in quality of life. Warfighters are commonly exposed to blast and blunt impact events which are a primary concern due to blast and high rate head acceleration induced traumatic brain injury (TBI). Monitoring exposure to blast and blunt impact and correlating exposures to observed injuries can assist in assessing and eventually protecting against injuries. Once injuries have been correlated with blast exposure, the monitoring device allows medical practitioners and leadership to assess a soldier's level of exposure and gauge





his potential injury. Historically, sensors were mounted on the helmet. However, an accelerometer and pressure monitoring device positioned in the ear canal provide improved coupling to the head and address three key issues faced by today's armed forces: hearing protection, hearing amplification, and acceleration and pressure monitoring due to blast or blunt impact exposure. Sound Innovations, Inc., located in White River Junction, VT, has developed a Multi-Functional Earpiece (MFE). The MFE provides more comfortable in-ear hearing protection and amplification that improves battlefield performance by enhancing the soldier's hearing, maintaining situational awareness, and measuring/recording head accelerations and pressures during blast and blunt impacts. This system is compatible with the U.S. Army Advanced Combat Helmet (ACH) and all other equipment worn by the soldier. The U.S. Army is currently testing and evaluating the MFE.



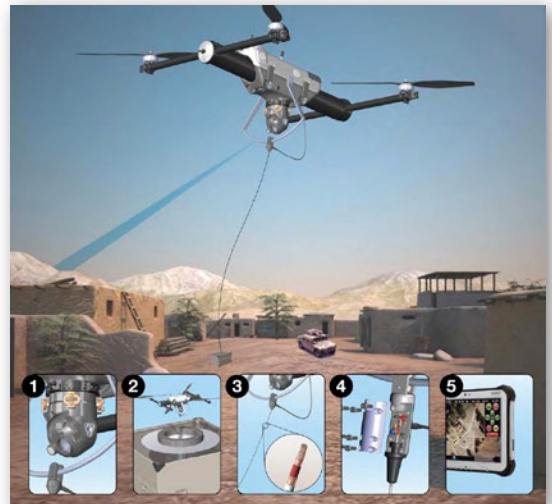
## PP CURRENT PROJECTS

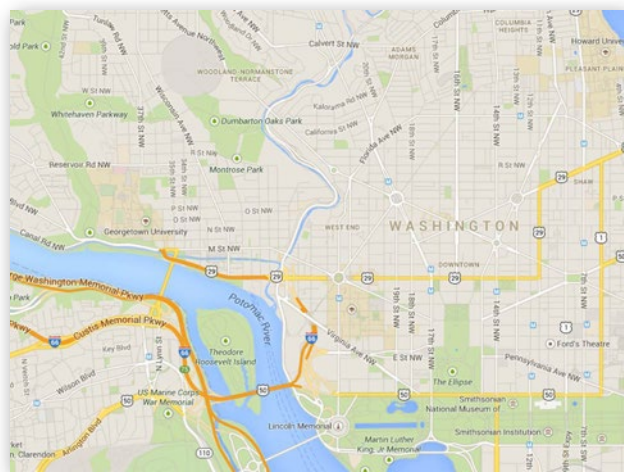
### NIJ Level IV Reduced Areal Density Body Armor

The need exists for a body armor solution that provides an increased amount of coverage area without increasing the mass load on the wearer. The goal of this project is to yield a material with an areal density approximately 30 percent less than current solutions. The Naval Surface Warfare Center (NSWC), Panama City Division, is developing a multi-layer body armor system that will combine exceptionally lightweight materials and novel bonding techniques for a system level solution. The first layer will decelerate and deform the projectile, followed by a layer that is designed to absorb the energy of the projectile through deformation, followed by a final layer that will protect against spalling (i.e., breaking into smaller pieces) and partial penetration. The layered armor solution will integrate compound curvatures to provide comfort for the human body.

### Tethercraft

The popularity and expanding use of small unmanned aerial vehicles (UAVs) has increased due to the situational awareness and enhanced communications capabilities they provide in support of military and law enforcement activities. Current Federal Aviation Administration (FAA) regulations and system power constraints limit the long term use of free flying UAVs. A tethered aerial asset would extend flight endurance indefinitely and provide the desired situational awareness and communication capabilities. The tether can be used as a conduit for power, control signals, and data transmission while eliminating the requirement for FAA Certificates of Authorization. AeroVironment, Inc., located in Monrovia, CA, is developing a tethered system to be deployed for situational awareness and enhanced communication capabilities during emergency situations. The tethercraft will be modular so that the payload can be easily adjusted between a communications line of sight relay for tactical environments and an intelligence, surveillance, and reconnaissance suite. The payloads will include electro-optical/infrared (EO/IR) cameras for day/night surveillance and an encrypted communications repeater. Power and control signals will be carried through the tether while data transmission will be facilitated by a wireless, encrypted, digital data link to provide the video feed to other viewing terminals in the vicinity. The tethercraft will have a maximum altitude of 250 feet above ground level and fly indefinitely on shore power.





## Graphics Processing Unit Map

Current geospatial display solutions are either expensive or difficult to implement because of massive storage space and infrastructure demands and burdensome licensing fees. This effort will develop a software application that provides real-time generation of accurate worldwide street map data to our deployed end users who operate in bandwidth constrained environments with little to no data storage capacity. Although mapping software exists on the market, it is very expensive and requires constant refreshing. Blackbird Technologies, Inc., located in Herndon, VA, has developed three cooperating software solutions to accelerate its usage of open-source, freely available worldwide street map data in bandwidth constrained environments. Following software development, Blackbird will explore an open source release to provide low-cost geospatial options to federal and state governments.



## PP MEMBERSHIP

### Intelligence Community

#### U.S. Capitol Police

#### U.S. Department of Commerce

- National Institute of Standards and Technology
- Office of Law Enforcement Standards

#### U.S. Department of Defense

- Defense Threat Reduction Agency
- Joint Improvised Explosive Device Defeat Organization
- Joint Personnel Recovery Agency
- Pentagon Force Protection Agency
- Rapid Reaction Technology Office
- U.S. Air Force
  - Office of Special Investigations
- U.S. Army
  - Criminal Investigation Command
  - Joint Trauma Analysis and Prevention of Injury in Combat

- Medical Research and Material Command
- Natick Soldier Systems Center
- Program Executive Office Soldier
  - Soldier Protection and Individual Equipment
- Research, Development, and Engineering Command
- Research Laboratory
- Tank Automotive Research, Development, and Engineering Center
- U.S. Navy
  - Naval Air Systems Command
  - Naval Criminal Investigative Service
  - Program Executive Office, Ships
- U.S. Special Operations Command
  - U.S. Army Special Operations Command

### U.S. Department of Energy

#### U.S. Department of Homeland Security

- Bureau of Customs and Border Protection
- Federal Air Marshal Service
- Federal Law Enforcement Training Center
- U.S. Secret Service
  - Special Services Division, Technical Security Division

#### U.S. Department of Justice

- Federal Bureau of Investigation
- National Institute of Justice
- U.S. Marshals Service

### U.S. Department of State



# PHYSICAL SECURITY





# MISSION

Identify and prioritize interagency physical security requirements to protect forces, vital equipment, and facilities against terrorist attacks; execute research and development projects that address those requirements; and transition successful prototypes into programs of record or into immediate field use to meet urgent operational needs.

The Physical Security (PS) Subgroup hosts regularly scheduled working group meetings that bring together scientists, researchers, intelligence officers, operators, and academia from the interagency and international communities to collaborate on efforts, identify capability gaps, and build a collective path forward. The following five areas have active working groups: Subterranean Operations, Homemade Explosives, Vehicle Barriers, Video Analytics, and Waterside Security.

# FOCUS AREAS

## **Blast Effects and Mitigation**

Develop projects to satisfy interagency and international requirements that address blast threats and blast mitigation efforts to protect expeditionary and permanent structures. Emphasize the development of decision support tools and field aids; testing to evaluate infrastructure blast response to advance technologies to harden infrastructure; and improve design standards, retrofits, and threat mitigation criteria.

## **Emerging Explosive Threats**

Develop projects to satisfy interagency and international requirements that address the adaptive threat associated with emerging explosives. Emphasize characterization of explosives and novel delivery techniques to combat their use in terrorist activities. Coordinate requirements received from the Homemade Explosives Working Group across appropriate CTTSO programs.

## **Integrated Solutions**

Integrate technologies into force protection solution packages that will improve the effectiveness of electronic security systems, reduce manning requirements, and offer increased affordability and survivability of operators and responders.

## **Screening, Surveillance, and Detection**

Develop technologies and techniques to survey and analyze facilities; improve situational awareness; detect, identify, and locate advancing threats; control access to critical assets; and neutralize confirmed threats. Emphasize automatic alerting, expeditionary kits, and exportable variants.

## **Vulnerability Identification**

Develop predictive analysis software and decision aids to identify vulnerabilities and/or determine preventative courses of action. Emphasize pre-event planning and assessment of emerging threats.

*[pssubgroup@cttso.gov](mailto:pssubgroup@cttso.gov)*



## PS COMPLETED PROJECTS



### Active Vehicle Barrier Selection Resources

With the constant threat of international and domestic terrorism, and the continued use of VBIEDs, many federal, state, local, and private facilities want to improve their physical security by controlling the access of potential threat vehicles to their sites. Many active vehicle barrier (AVB) specification documents are employed by the physical security community as well as an extensive array of available AVB products. Due to the wide range of product options and multiple sources of limited guidance, facility and security managers have a difficult time knowing where to begin their planning process. CTTSO, in collaboration with the U.S. Department of State, has

created user-friendly guidance to assist with site planning and design, facility protection criteria, and AVB model selection. Also, a comprehensive compilation of currently available domestic and international AVBs has been created to assist a user with finding the AVB product that fits their specifications. This product is available for use by government and private organizations.

### Improvised Detonator Characterization



The U.S. military and counterterrorism forces frequently encountered foreign-made IEDs during Operation Enduring Freedom and Operation Iraqi Freedom, as well as other overseas operations. This project has successfully acquired, characterized,

and advanced the body of knowledge surrounding the electromagnetic, electrical, and thermal properties of improvised initiators and detonators. This information has allowed researchers to understand what materials have been used to fabricate these improvised detonators and to characterize their effectiveness. Information gleaned from this project has been disseminated in classified and unclassified reports to applicable counterterrorism and EOD forces to prepare them to safely handle these improvised devices and help them recognize associated precursor materials.

## PS CURRENT PROJECTS



### Temporary Anti-Personnel Barrier System

As the threat climate for U.S. overseas facilities has increased, there is a need for increased protection against angry mobs and violent crowds. The Temporary Anti-Personnel (TAP) Barrier System is intended as a field deployable, enhanced crowd control measure to protect high value targets such as embassies and consulates against hostile personnel. The TAP Barrier System will be lightweight, modular, and able to be quickly assembled from individual elements by a four member team. It will be capable of delaying or deterring hostile personnel that may attack the TAP Barrier System with locally available implements, such as sticks, rocks, and hammers, allowing

U.S. personnel the opportunity to conduct directed courses of action (e.g., marshaling, egress, and destruction of classified material). The system will stand over nine feet high and will be configured so as not to provide cover or concealment to potential attackers. The barrier is also designed to fit and be transported in an ISO shipping container to facilitate deployment and storage. Although the initial use is intended for overseas facility protection, the TAP Barrier System has many features that could be beneficial to domestic law enforcement communities.



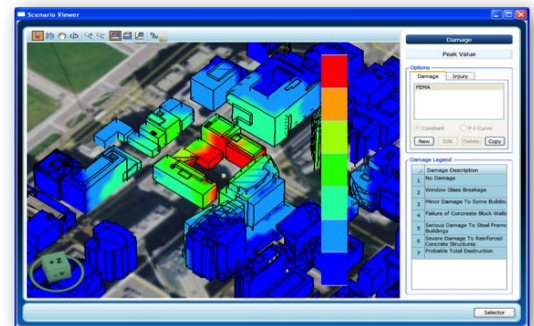
## Explosive Equivalency

Under a bilateral agreement between CTTSO and the Future Systems and Technology Directorate, Singapore Ministry of Defence, a new explosive equivalency testing software is being developed. Explosive equivalency testing has historically been linked to equivalency with trinitrotoluene (TNT). However, results can vary significantly depending on the methods used to calculate that equivalency. This computer-based tool will more accurately calculate the equivalence between TNT and other explosives. The software will focus on five main parameters and explosive conditions, which will be linked to an equivalency, such as peak pressure, impulse, brisance (i.e., shattering effect), environmental conditions, and confinement. The software will guide users through a step-by-step process to identify the correct parameters for their specific scenario/situation, and based on the user's findings, will calculate potential damage assessments/equivalence related to TNT. The tool is intended for more technical applications such as engineering and research, although the software could be used by military or law enforcement communities for operational considerations. The software will be compatible with Windows and Apple operating systems and accessible via the Web.



## Rapid City Planner

Currently, explosive modeling software programs are either complex, slow-running, and time-consuming systems that produce credible results, or faster-running programs that sacrifice modeling accuracy for speed. Under a bilateral agreement between CTTSO and the Defence Research and Development Canada (DRDC), the Rapid City Planner is under development to equip emergency management planners, operations personnel, and first responders with a faster, more accurate, and more portable high fidelity Computational Fluid Dynamics (CFD) model capable of predicting the effects of a blast in a real-world environment. Advanced software techniques, emerging hardware acceleration, and modern CFD technology enable simulations to run in Rapid City Planner 50 times faster than its predecessor, with an end goal of running 80 times faster. As a result, complex blast modeling that previously took days to generate can now be run in hours without compromise to the model's accuracy and physics-based results. Rapid City Planner's library will contain a wide array of ideal and non-ideal explosives and, through the use of an embedded Google Earth application, will be able to run models on specific locations. Rapid City Planner will allow users to plan for and respond to an extreme urban explosive event more efficiently and effectively in a time-sensitive situation.





## PS MEMBERSHIP

### Environmental Protection Agency

### Federal Reserve Board

### Intelligence Community

### National Reconnaissance Office

### State and Local Law Enforcement

- DC Metropolitan Police
- DC Protective Services Police Department
- Jacksonville (FL) Port Authority
- Lynchburg (VA) Sheriff's Office
- New York Police Department
- Pinellas County (FL) Sheriff's Office
- Port Authority of New York and New Jersey

### U.S. Capitol Police

### U.S. Department of Commerce

- National Institute of Standards and Technology

### U.S. Department of Defense

- Defense Advanced Research Projects Agency
- Defense Intelligence Agency
- Defense Threat Reduction Agency
- Explosives Safety Board
- Joint Chiefs of Staff
- Joint Improvised Explosive Device Defeat Organization
- Joint Non-Lethal Weapons Directorate
- Joint Task Force North (NORTHCOM)
- Joint Warfare Analysis Center (JFCOM)
- Office of the Secretary of Defense
- Physical Security Enterprise and Analysis Group
- Unified Combatant Commands

### • U.S. Air Force

- Research Laboratory

### • U.S. Army

- Armament Research, Development, and Engineering Center
- Asymmetric Warfare Group
- Corps of Engineers
- Office of the Provost Marshal General
- Rapid Equipping Force
- Research, Development, and Engineering Command
- Research Laboratory
- Training and Doctrine Command

### • U.S. Marine Corps

- Central Command
- Special Operations Command
- Systems Command
- Warfighting Laboratory

### • U.S. Navy

- Chief of Naval Operations
- Commander Navy Installations Command
- Expeditionary Combat Command
- Explosive Ordnance Disposal Technology Division
- Naval Criminal Investigative Service
- Naval Facilities Engineering Command
- Naval Facilities Engineering Service Center
- Naval Special Warfare Center
- Naval Special Warfare Development Group
- Office of Naval Research
- Sea Systems Command
- Strategic Systems Programs

### • U.S. Special Operations Command

- Naval Special Warfare Command
- U.S. Army Special Operations Command

### U.S. Department of Energy

- National Nuclear Security Administration
- Nuclear Regulatory Commission

### U.S. Department of Homeland Security

- Customs and Border Protection
- Immigration and Customs Enforcement
- Science and Technology Directorate
- Transportation Security Administration
- Transportation Security Laboratory
- U.S. Coast Guard
- U.S. Secret Service

### U.S. Department of the Interior

- Bureau of Reclamation

### U.S. Department of Justice

- Bureau of Alcohol, Tobacco, Firearms and Explosives
- Drug Enforcement Administration
- Federal Bureau of Investigation
- Federal Bureau of Prisons

### U.S. Department of State

- Bureau of Diplomatic Security

### U.S. Department of Transportation

- National Transportation Systems (Volpe Center)

### Virginia Department of Transportation





THIS PAGE  
INTENTIONALLY  
LEFT BLANK

## SURVEILLANCE, COLLECTION, AND OPERATIONS SUPPORT



# MISSION

Identify, prioritize, and execute research and development projects that satisfy interagency requirements supporting intelligence collection and special operations directed against terrorist activities.

The Surveillance, Collection, and Operations Support (SCOS) Subgroup identifies high priority requirements and special technology initiatives focused primarily on countering terrorism through offensive operations. The SCOS Subgroup research and development projects enhance U.S. capabilities to conduct retaliatory or preemptive operations and to reduce the capabilities and support available to terrorists.

# FOCUS AREAS

## **Biometrics, Recognition, Identity Management, Tracking, and Exploitation (BRITE)**

Improve the means to detect terrorists by developing automated tools for terrorist identification using biometrics, pattern recognition, database technologies, and exploitation methodologies.

## **Canine Advanced Technologies**

Develop methodologies that enable canine teams to operate more effectively and efficiently by enhancing canines' abilities for explosives detection, tracking, patrolling, and offensive capabilities in an operational environment.

## **Counter-Surveillance**

Develop advanced automated tools to defeat adversarial surveillance methodologies. Develop technologies to assist tactical teams with verification of assets and more effective use of interrogation data.

## **Human Language Technology and Media Exploitation**

Develop and insert human language technologies where these technologies can best assist humans (i.e., operators and analysts) to make sense of volumes and varieties of data sources, apply timely and actionable intelligence, enhance communication skills and cultural understanding, and improve language learning.

## **Surveillance**

Develop and improve the ability to locate, identify, and track terrorists and their activities. Support programs and initiatives critical to intelligence operations such as tagging, tracking, and locating; special sensors; and special communications.

[scossubgroup@cttso.gov](mailto:scossubgroup@cttso.gov)



## SCOS CURRENT PROJECTS

### Selection Methodology

The most recognized role of our Special Operations Forces (SOF) is conducting special missions that exploit even the slightest weakness of our adversaries. These highly complex, high risk missions conducted in remote regions of the world are being planned and executed by a select group representing .001 percent of our national population. The strength and success of these elite units rely heavily upon each individual's contribution to the team. In the past, SEAL training has led to the historic over-valuing of physical performance and undervaluing of character attributes. Selection error—graduating fit athletes that were not good teammates—has serious consequences. This effort is focused at the root of that selection by establishing what matters most to being a SEAL operator, providing cadre members insight into the entire class (eliminating the Gray Man), measuring critical skills and attributes, and creating a process that enables cadre members to identify and focus on developing the trainee, and tracking his performance and progress throughout his assessment and training.



### Stew Theory Evaluation

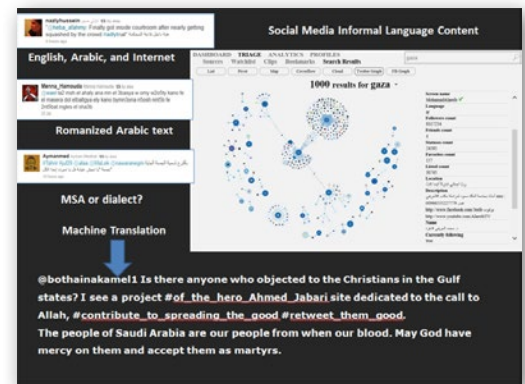
Preparing explosives detection canine teams for operational deployment requires significant time and resources. In an attempt to expedite this training, some canine trainers have instituted the “stew” imprinting method. Rather than training the canine in an additive manner, where targets are introduced one at a time as isolated odors, the stew method presents a bouquet of multiple target odors at once. Many canine experts attest that canines naturally differentiate odors within such a mixture, and therefore, simultaneously develop some level of proficiency on all targets in the bouquet. However, there is no defensible evidence of this concept. The effort will provide an objective assessment of proficiency (i.e., detection ability and selectivity) of canines trained on the “stew.”





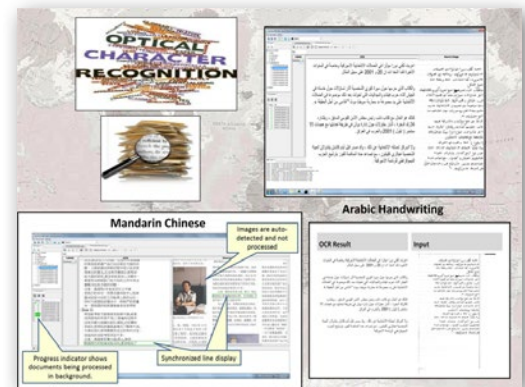
## Machine Translation of Social Media Content

Tools created for Modern Standard Arabic fail when applied to dialects. Also, machine translation that works on news articles does not adapt automatically to informal social media content. This project's objective is to address the challenges posed by the volume and variety of informal content emerging in Arabic social media. The goal is to improve automated translation of Arabic (including Egyptian and Levantine dialects) twitter content by leveraging DARPA's Broad Operational Language Translation (BOLT) effort and by addressing the following critical variables: metadata, dialect, normalization, deromanization, morphology, and spelling. This project will produce an operational software engine that is inserted into various existing media exploitation systems and will enable users to gist the content of foreign Arabic tweets, extract overall trends, and make sense of specific content.



## Optical Character Recognition

This project incorporates DARPA's Multilingual Automatic Document Classification, Analysis, and Translation (MADCAT) algorithms that have made meaningful progress in recognizing Arabic handwriting. The CTTSO effort focuses on transitioning the research into operational engines. In addition to Arabic, our effort focuses on optical character recognition (OCR) accuracy and data alignment for Mandarin Chinese, especially technical and scientific content such as tables, images, and mathematical formulas. With the capability to transform images into text and digitizing content for further exploitation, the goal of this project is to insert the operational OCR engine into three customers' environments and workflows. Alignment tools and post edit capabilities will be included to train the system on operational data, resulting in additional accuracy and utility.



## SCOS MEMBERSHIP

Intelligence Community

U.S. Special Operations Command





# TACTICAL OPERATIONS SUPPORT



# MISSION

Identify, prioritize, and execute rapid research and development projects that enhance the capabilities of DoD and interagency special operations tactical teams engaged in finding, fixing, and finishing terrorists. This includes the development of capabilities for state and local law enforcement agencies to combat domestic terrorism.

The Tactical Operations Support (TOS) Subgroup rapidly delivers advanced capabilities to surgical strike and special warfare operational personnel conducting full spectrum tactical combating terrorism missions in high threat, unsupported environments to defeat global emerging threats. Most often these solutions are in the form of rapidly prototyped, specialized equipment, and training. Each advanced capability is specifically designed to provide enhanced mission effectiveness while assisting operational personnel in maintaining situational awareness and survivability. The TOS Subgroup is co-chaired by representatives from the Department of Defense and the Department of Energy.

# FOCUS AREAS

## **Intelligence, Surveillance, Target Acquisition, and Reconnaissance (ISTAR) Systems**

Develop technologies to assist tactical teams in conducting intelligence, surveillance, target acquisition, and reconnaissance missions. Develop systems that enhance the visual perception or other imaging capabilities of tactical operators in all conditions and environments. Develop independent, platform, or weapon-mounted systems for enhanced aiming, target designation, illumination, range detection, or surveillance.

## **Offensive Systems**

Develop equipment and capabilities that enhance the effectiveness of small tactical units of dominance engaged in surgical strike operations. Develop specialized weapons, munitions, detonators, distraction/diversion devices, and other unique tactical equipment. Develop systems to support sniper and counter-sniper operations.

## **Specialized Access Systems**

Develop technologies that assist tactical assault forces in gaining rapid access to objectives, improve evaluation of tactical options, and support efficiency and stealth of operations. Develop enhanced manual and dynamic breaching technologies for tactical assault teams. Develop clandestine defeat or override devices for building and vehicle entry points.

## **Survivability Systems**

Develop clothing, individual equipment, mobility platform enhancements, and man-portable systems that provide protection from or identification of ballistic, fragmentation, explosive, and thermal threats during the conduct of special operations. Develop man-portable sensor systems to enhance operator security and survivability during tactical missions.

## **Tactical Communications**

Develop flexible, enhanced, full spectrum communications capabilities specifically designed for tactical forces. Emphasize reducing operational load while improving operator mobility and efficiency. Performance factors include durability, concealment, power management, range, reception, battery life, ease of use, and low probability of exploitation. Develop assured tactical communications connectivity in challenging environments such as buildings, caves, tunnels, below deck, or underground bunkers.

## **Unconventional Warfare, Counter-Insurgency Support**

Develop innovative solutions for small tactical units of dominance conducting a broad spectrum of military, paramilitary, special warfare, and digital operations. This includes counter-insurgency and foreign internal defense missions by, with, or through host nation or indigenous forces, to build partner capacity in support of U.S. goals and objectives.

[tossubgroup@cttso.gov](mailto:tossubgroup@cttso.gov)



## TOS CURRENT PROJECTS



### Micro Tactical Ground Robot

Special Operations Forces (SOF) and Explosive Ordnance Disposal (EOD) units have a critical need for highly mobile, lightweight, ground robotic systems to detect, disable, and defeat the IED threat on today's battlefield. The Micro Tactical Ground Robot (MTGR) is an advanced visual and acoustic intelligence, surveillance, and reconnaissance (ISR) platform featuring 360° day/night camera coverage, two eye-safe laser pointers, white light, and an internal microphone. The MTGR is highly maneuverable in all terrain and environments with the ability to climb stairs and steep inclines. The MTGR is light enough to be parachuted in and transported by a dismounted operator across rugged terrain over long distances providing support to SOF and EOD conducting ISR and C-IED missions. The MTGR provides multiple advanced communication enablers, such as an ISR communications relay, and a National Security Agency (NSA) Suite B-encrypted Mobile Ad-hoc Mesh Radio Network which also greatly improves the safe standoff distance for operators and non-combatants when rendering safe or emplacing an IED counter charge using its unique manipulator arm and gripper camera assembly. Additionally, the MTGR has an internal GPS receiver and digital magnetic compass (DMC) for

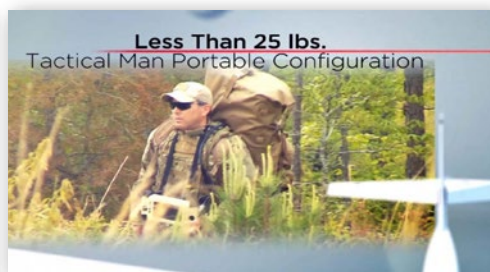
position reporting to ensure command and control for situational awareness and recovery. All of these features are supported and managed by an intuitive Graphical User Interface (GUI) and Ruggedized Operator Control Unit (ROCU) to allow for decreased training time and need for operator specialization. The MTGR is the lightweight ground robotic system that is currently filling the tactical level combat capability gap for SOF and EOD. DoD units have received kits and training to conduct combat operational evaluations. Federal, state, and local interagency tactical teams have also received kits and training in support of real world domestic operations in FY14.



### ArrowLite: Small Hand-Launched Unmanned Aerial System

SOF requires advanced lightweight, organic, dismounted, unmanned, aerial ISR with increased endurance, visual acuity, and encrypted downlink to support dismounted tactical operations. CTTSO has partnered with Canada to create ArrowLite, a state-of-the-art, organic aerial ISR capability that can be assembled and hand-launched in under 90 seconds after removal from its waterproof, military free-fall transportable carrying case and is capable of operating for over 2.75 hours (from launch to landing). The system consists of the Procerus 2-axis mechanical gimbaled, stabilized sensor with laser illuminator, and uses an NSA Suite B-encrypted Mobile Ad hoc Mesh Radio Network with a multi-functional Ground Control Station (GCS), ROCU for Level III flight control with full autopilot authority, and additional ROCU

terminals that serve as Remote Video Terminals (RVT). Total weight of the system including air vehicle with payload, carrying case, mobile ad-hoc network (MANET)







radios, ROCU-7 GCS and RVT, directional antenna with tripod, cables, and military standard batteries is less than 23 pounds. ArrowLite kits and new equipment training have been delivered to several DoD and interagency special operations tactical units for operational assessments and deployments.



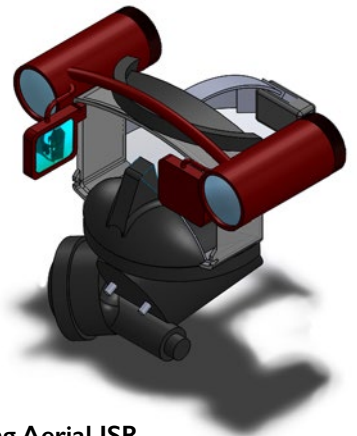
### Next Generation Tactical Mesh Network

The Next Generation Tactical Mesh Network (NG-TacMN) is an NSA Suite B-encrypted, state-of-the-art Mobile Ad-hoc Mesh Network communications kit that integrates tactical communications technologies to rapidly close the sensor-to-operator loop. The NG-TacMN provides tailored, self-healing, organic, and server-less communications infrastructure that enhances networked information, command and control, situational awareness, and operational surety. System components include hardware and software solutions, radios, handheld ruggedized operational control units, situational awareness software, and tactical sensors that integrate with legacy and new C4I components. This sophisticated communications kit is capable of secure dissemination and viewing of multiple Full Motion Video (FMV) streams, point-to-point and group chat, Voice-over Internet Protocol (VOIP), Blue Force tracking, map telestration, and file transfer. DoD and interagency tactical units will receive final production kits and new equipment training to conduct operational evaluations in FY14 through FY15.



### Underwater Vision Enhancement

The Underwater Vision Enhancement (UVE) device provides EOD and combat divers the ability to perform hands-free and render-safe procedures as well as close quarter prosecution of ship attack charges and Underwater Improvised Explosive Devices (UWIED) at night or in reduced visibility. The UVE is a low profile, low volume vision enhancement device that interfaces on current standard Navy dive masks and allows the diver the ability to conduct hull/maritime structure search/inspection in both clear and turbid water without the use of an external light source while also enhancing vision above the water line. The UVE uses a combination of cutting edge sensor, display, and software technologies to provide the first all-digital and dive-ready night vision device (NVD) that gives the diver a large field of view at higher resolution. DoD and interagency dive units will receive final production kits and new equipment training to conduct maritime operational evaluations in FY15.



### Tactical Tethered Hovering Aerial ISR

United States tactical operations units working around the world routinely conduct missions in high threat environments that require organic aerial ISR support. Currently, the available tactical aerial ISR capabilities are traditional UASs which require certified UAS pilots. The Tactical Tethered Hovering Aerial ISR (TTHAISR) system removes the



requirement for UAS pilots and allows personnel without UAS certification to operate and obtain aerial ISR. The TTHAISR provides an organic, rapidly deployable/re-deployable tethered ISR capable platform that can be launched to a maximum altitude of 160 feet. The TTHAISR has an EO/IR gimbaled camera payload, an integrated secure Mobile Ad-hoc Mesh Radio Network to operate as a secure communications systems relay, and a laser range finder to obtain and relay target position/location information to controlling elements and higher headquarters. The system is mobile and can be integrated onto light commercial ground and maritime platforms allowing for use in high threat, unsupported, and austere operating environments. DoD and interagency tactical units will receive final production kits and new equipment training to conduct real world and combat operational evaluations in FY15.

### **Maritime Canister Launched Small Unmanned Aviation System: Phase I - Proof of Concept**

SOFs operating in maritime environments lack an organic small Unmanned Aviation System (UAS) capable of being deployed while submerged to support surface surveillance and reconnaissance missions. The Maritime Canister Launched Small Unmanned Aviation System (MCLSUAS) provides SOF maritime forces the ability to launch a collapsible-wing UAV in Sea State Three (3) conditions from a canister system that is capable of both launch and reuse after recovery. The battery powered small tactical UAV is capable of transmitting ISR data via a floatable and tethered NSA Suite B-enabled Mobile Ad-hoc Mesh Radio Network integrated to either a host underwater platform or an underwater capable GCS. The air vehicle has a minimum operating time of 70 minutes and is capable of 50 knots dash speed and stall speeds of 15 to 20 knots. The UAV is designed to stay afloat for a minimum of 30 minutes for recovery and reuse. The MCLSUAS will provide required real-time ISR information for SOF maritime operations. The initial phase of the effort consists of a full canister launch and flight demonstration in FY15 that will be followed by the development of prototype systems for operational user evaluations in FY16.



### **Aerial ISR High Definition Upgrade**

SOF requires an organic tactical ISR solution that incorporates a high definition (HD) electro-optical/infrared/laser pointer/laser range finder (EO/IR/LP/LRF) payload with sufficient resolution to support observation from an extended standoff range. The Aerial ISR HD Upgrade initiative takes a legacy Plug-in Optronic Payload 300 (POP 300) EO/IR full motion video (FMV) capable payload and replaces it with an HD capable sensor. This improved aerial ISR sensor provides a significant increase in capability at a lower cost than developing new sensor technology and includes the following capabilities in the EO/IR gimbal: Target Location Error (TLE); high power laser pointer (LP); EO HD imaging; and scene tracker capability. In addition, these ISR upgrade kits will enable the distribution of FMV and ground-based control of the airborne payloads in a dynamic environment over a highly reliable, secure Mobile Mesh Ad-hoc Network data link which is already being fielded within the specified tactical operator community. These aerial ISR upgrade kits will enable existing manned and unmanned aviation assets to more fully support operations that require combat systems to rapidly close the sensor-to-shooter loop by providing positive target identification and reducing the potential for fratricide and civilian casualties. The Aerial ISR HD Upgrade initiative will develop, integrate, demonstrate, train, and deliver eight kits on both small, manned, fixed wing aircraft and the RQ-7B Shadow Unmanned Aviation System to DoD and interagency tactical operations units in FY14 through FY16.



### Enhanced Mortar Targeting System – Mobile

United States SOF deployed globally to high threat locations require an organic, highly-accurate, rapid, and mobile indirect fire capability for force protection. The Enhanced Mortar Targeting System – Mobile (EMTAS-Mobile) incorporates a state-of-the-art enhanced ballistic computer with an 81mm mortar integrated on a highly mobile light commercial vehicle with enhanced suspension. The entire system is provided as a kit to allow for quick installation in austere environments. With only two operators, the EMTAS-Mobile is ready to fire in less than 45 seconds, delivering lethal consequence to the enemy, 360 degrees, out to 5.5 kilometers with a circular error probability of 1 percent. The EMTAS-Mobile capability enhances the speed, accuracy, and reliability of legacy weapons and ammunition, and provides U.S. SOF and host nation partners with a highly accurate, highly mobile, and low-visibility indirect fire support platform that improves small unit survivability while minimizing the risk of collateral damage. U.S. SOF units will receive final production kits and new equipment training to conduct combat operational evaluations in FY14 through FY15.



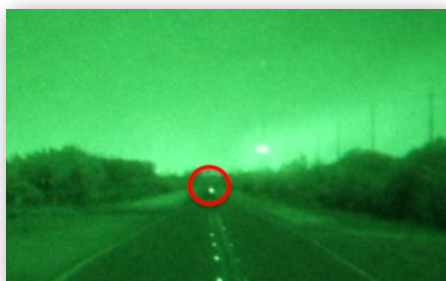
### SOF Advanced Ballistic Engine and Rangefinder

Tactical operators conducting surgical strike missions require a weapon-mounted, operational environment-calibrated, ballistic-engine driven laser range finder (LRF). The SOF Advanced Ballistic Engine and Rangefinder (SABER) system will maximize the shooter's ability to successfully interdict hostile targets at increased ranges when using issued 5.56mm and 7.62mm weapons systems. As the shooter acquires his target, he will also have access of relevant variables for the firing solution—without taking his eyes off the threat, reducing the time penalty and expended ammunition to neutralize the threat. Tactical units will receive final production kits and new equipment training to conduct combat operational evaluations in FY15.



### Tactical Platform Marking Kit

Tactical teams require advanced capabilities to discretely mark structures and vehicles for identification and tracking. The Tactical Platform Marking Kit (TPMK) is a self-adhering material that allows for discrete “in-stride” mission application by the operator in permissive, semi-permissive, and non-permissive environments. The TPMK is a persistent, visibly transparent, IR luminous material that can be detected with NVDs and does not require active IR illumination. The non-toxic marking material will maintain its luminescence and will not be significantly degraded by extreme climatic variations during operations. The TPMK will enhance tactical operators' ability to discretely mark and track targets when conducting surveillance. DoD and interagency tactical units will receive final production kits and new equipment training to conduct operational evaluations in FY15.



### Personal Tactical Micro Marker System Kit

Tactical missions in semi-permissive and non-permissive environments place operators at a high risk of detention and/or capture by hostile forces. These operators currently lack a low cost, discrete means of identifying themselves to friendly forces while under duress or isolated





from allies. The Personal Tactical Micro Marker System (PTMMS) kit is a Personnel Recovery (PR) suite that utilizes cutting edge micro-optical infrared emitters. The PTMMS kit provides a low visibility approach for the problem of locating and identifying isolated personnel for recovery. DoD and interagency tactical units will receive final production kits and new equipment training to conduct operational evaluations in FY15.

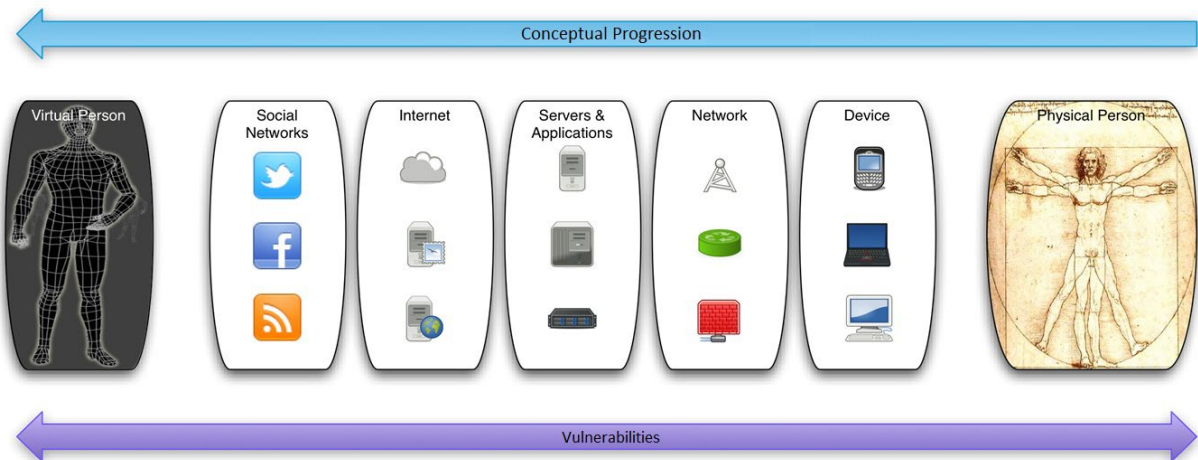


### Man-Portable Aerial Radar System

The Man-Portable Aerial Radar System (MARS) is a dual mode, man-packable, easily deployed radar that provides small tactical units with the organic capability to detect and track small unmanned air systems and ultra-light aircraft as well as provide detection and tracking of personnel and vehicle ground targets. MARS incorporates existing as well as cutting edge radar technologies at a significantly reduced size and weight with enhanced communications and control hardware to give the operator early warning to mitigate emerging threats. MARS is a game-changing situational awareness tool for tactical units deployed in austere environments for force protection and counter UAS operations, greatly increasing operator battlefield survivability. DoD and interagency tactical units will receive final production kits and new equipment training to conduct operational evaluations in FY15.

### WATSON

The digital domain has become key terrain on the 21st century battlefield. Our nation continues to encounter an increasing cyber threat where a “digital divide” exists between the U.S. and our cyber opponents. The larger government and military organizations are standing up capacities and capabilities to address this threat at the strategic level. At the request of SOF, CTTSO has taken the initiative to complement this larger effort by training operators at the tactical level. WATSON is an unclassified, open source, digital operations course tailored to train tactical operators to understand the digital domain and to identify and mitigate cyber threats. This 5-week intensive course provides foundations in computer science, information security, social media, social engineering, and advanced computer networking. The knowledge gleaned from this instruction is validated in over twenty practical field training events and one comprehensive, full mission profile, 3-day culmination exercise. Tactical operators trained at WATSON return to their units as trainers in cyber tactics, techniques, and procedures. In FY14 through FY15, WATSON continues to contribute in the development of DoD and interagency SOF tactical capabilities designed for 21st Century Special Warfare cyber enabled operations.







## Cyber Advanced Support Operations

Social media has become a primary means of communication globally. This medium is being leveraged and exploited by state and non-state actors to coordinate and conduct illegal and terrorist activities against U.S. and allied interests. At the request of SOF, CTTSO is providing a 2-week intense training course that teaches enhanced operational and tactical level capabilities within the cyber domain pursuant to the ARSOF (Army Special Operations Forces) 2022 vision. Cyber Advanced Support Operations (CASO) provides select tactical operators an advanced understanding of how to garnish, use, understand, and analyze metadata information from the online environment. The course includes in-depth training on state-of-the-art social media tools and hands-on, operationally relevant, and practical exercises in the digital domain. CASO trained operators acquire skills and replicable lessons learned that are focused on and unique to conducting special operations globally in the digital environment. In FY14 through FY15, CASO continues to contribute in the development of SOF tactical capabilities build for 21st Century Special Warfare cyber enabled operations.





## TOS MEMBERSHIP

**National Tactical Officers Association****State and Local Law Enforcement**

- Boston (MA) Special Weapons and Tactics
- Denver (CO) Special Weapons and Tactics
- Indianapolis (IN) State Police Bomb Squad
- Los Angeles (CA) Police Department
- Los Angeles Sheriff's Department
- Maryland State Police Special Weapons and Tactics
- Massachusetts State Police Bomb Squad
- New York Police Department and Fire Department
- San Diego (CA) Sheriff's Department
- San Diego Fire Department and Bomb Squad
- South Carolina State Police Bomb Squad
- South Carolina State Police Special Weapons and Tactics

**U.S. Department of Defense**

- Cyber Command
- Defense Intelligence Agency
- Joint IED Defeat Organization
- Joint Personnel Recovery Agency
- National Guard Bureau
- National Security Agency
- U.S. Air Force
  - Explosive Ordnance Disposal
- U.S. Army
  - 20th Support Command, CBRNE
  - Armament Research, Development, and Engineering Center
  - Asymmetric Warfare Group
  - Maneuver Center of Excellence

- Night Vision and Electronic Sensors Directorate
- Office of the Army G-3/5/7 (Operations/Plans)
- Office of the Army G-8 (Financial Management)
- Program Executive Office Soldier
- Rapid Equipping Force
- Soldier Systems Center
- U.S. Marine Corps
  - Explosive Ordnance Disposal
  - Marine Corps Forces Cyber Command
- U.S. Navy
  - Naval Academy
  - Naval Air Weapons Station, China Lake
  - Naval Postgraduate School
  - Naval Surface Warfare Center, Carderock Division
  - Naval Surface Warfare Center, Crane Division
  - Naval Surface Warfare Center, Dahlgren Division
  - Navy Explosive Ordnance Disposal Group 2
- U.S. Special Operations Command
  - Air Force Special Operations Command
  - Army Special Operations Command
    - 75th Ranger Regiment
    - Army Special Operations Aviation Command
    - Civil Affairs
    - Military Information Support Operations Command
    - U.S. Army John F. Kennedy Special Warfare Center and School
    - U.S. Army Special Forces Command

- Joint Special Operations Command
- Naval Special Warfare Command
  - Naval Special Warfare Groups
  - Special Boat Teams
- Theater Special Operations Commands

**U.S. Department of Energy**

- National Nuclear Security Administration

**U.S. Department of Homeland Security**

- Federal Air Marshals Service
- Immigration and Customs Enforcement / Homeland Security Investigations
- Office for Bombing Prevention
- U.S. Bureau of Customs and Border Protection
  - Border Patrol Tactical Unit
- U.S. Coast Guard
  - Maritime Security Response Team
- U.S. Secret Service

**U.S. Department of Justice**

- Bureau of Alcohol, Tobacco, Firearms and Explosives
  - Special Response Team
- Federal Bureau of Investigation
  - Ballistic Research Facility
  - Critical Incident Response Group
  - Hostage Rescue Team
- U.S. Marshals Service

**U.S. Department of State**



THIS PAGE  
INTENTIONALLY  
LEFT BLANK

# TRAINING TECHNOLOGY DEVELOPMENT





# MISSION

Identify, prioritize, and execute projects that satisfy interagency requirements for the development and delivery of combating terrorism related education, training, and mission performance support products and technologies.

The Training Technology Development (TTD) Subgroup develops training and training technologies to optimize human performance, increase mission readiness, and enhance operational capabilities in the combating terrorism community. The strategy behind the mission is to analyze, design, develop, integrate, evaluate, and leverage distributed learning technologies to deliver high quality training and education in the medium best suited to the users' needs and requirements. A representative from the United States Special Operations Command (USSOCOM) chairs the TTD Subgroup.

# FOCUS AREAS

## **Advanced Training and Education**

Develop programs of instruction, training packages, and computer- and classroom-based terrorism training courses. Develop the advanced tools, techniques, and guidelines required to analyze needs, develop solutions, and evaluate results. Analyze performance needs to identify applicable solutions. Integrate and deliver technologies with combating terrorism training materials to increase the quality, effectiveness, and accessibility of training.

## **Human Performance Technology**

Analyze the full range of human performance gaps and select interventions to improve and sustain human performance. Develop enabling performance improvement technologies and devices to optimize the performance of operators during training missions. Develop job aids, best practices, human factors interactions, selection and motivation interventions, and performance support systems.

## **Mobile Learning**

Utilize mobile technology to deliver interactive learning solutions and applications for end users that can be accessed anytime and from anywhere. Develop mobile capabilities that support learning through ubiquitous access to performance support, educational resources, collaboration, user-generated content, and learning solutions for use in the classroom or in support of distance education.

## **Models, Simulations, and Games**

Develop interactive models, simulations, and games (MS&G) including but not limited to tabletop simulations, field exercise simulations, immersive virtual learning environments, hands-on virtual reality, simulation models, and PC-based three-dimensional and isometric simulations and games. Develop crowd models, adversarial behavior models, network-based simulations, and mini-simulations on specific combating terrorism related tasks. Incorporate beneficial game characteristics through the full range of game genres (i.e., strategy, first person tactical, massively multi-player online game, role playing, etc.). Develop tools, technologies, and techniques for improving MS&G design, development, and validation.

[ttdsubgroup@cttso.gov](mailto:ttdsubgroup@cttso.gov)



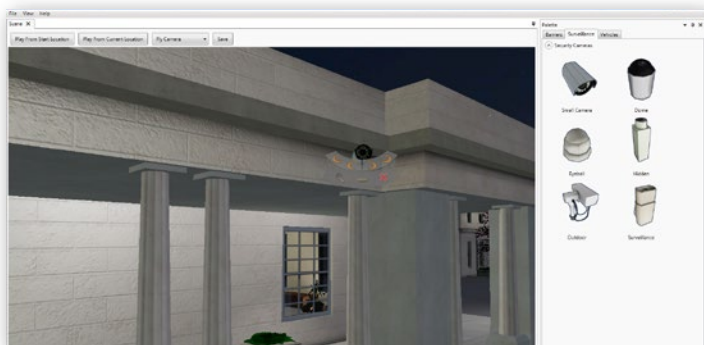
## TTD COMPLETED PROJECTS



### Digital Interactive Visual Dictionary

The Digital Interactive Visual Dictionary (DIVD) application is a combination of interactive, three-dimensional (3D) graphics with text-based information delivered through immersive technology (i.e., virtual environment). It can be used as a “wiki” training solution for highly visual 3D content. Students can independently or collaboratively build, manipulate, and interact with 3D objects and environments for training exercises or for use as performance support tools. The combination of text and interactive 3D models provides a deeper understanding of specific words and objects. Students can manipulate models from a micro and macro level to acutely expand their understanding of

an object. Adayana Government Group, headquartered in Indianapolis, IN, built the DIVD using mobile game technology and delivered it to PC-based browsers as well as mobile devices.



### Embassy Security Simulation

Quantum Signal, LLC, located in Saline, MI, developed an Embassy Security Simulation system to augment training of personnel in their roles of embassy security planning and execution. The interactive system leverages video game technology to provide a virtual embassy in which users can design, operate, and maintain security elements. The capability includes interactive security cameras and lighting objects with realistic illumination and coverage, accurate time of day effects based on embassy location, a measurement tool to determine exact relative distances of objects, and a series of instructor tools including student performance scoring

sheets. The Embassy Security Simulation system is currently being used in the classroom environment to reinforce lessons taught through engaging virtual content.

### Gunfighter's Gym

Conflict Kinetics, LLC, located in Sterling, VA, developed the Gunfighter's Gym, a laser-based performance simulation that delivers a 220° field of view to allow users to visually acquire and engage numerous targets. The system increases visual and situational awareness, and improves decision making and reaction speeds when engaging threats. Evaluations of the system have indicated quantifiable increases in the speed, accuracy, and number of targets that users were able to engage. The system enables users to process more information at a faster pace in order to keep forward momentum in assault-type missions. The system includes a five-screen laser-targeting system, movement drills, conditioning course, and eye tracking/target recognition.





## High Stakes Negotiations Program

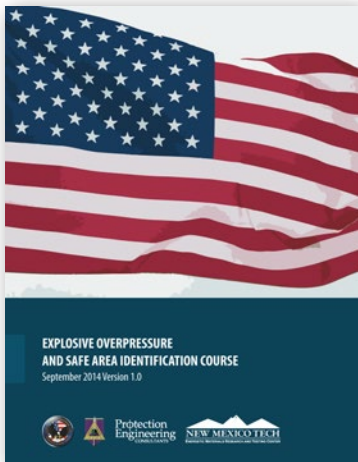
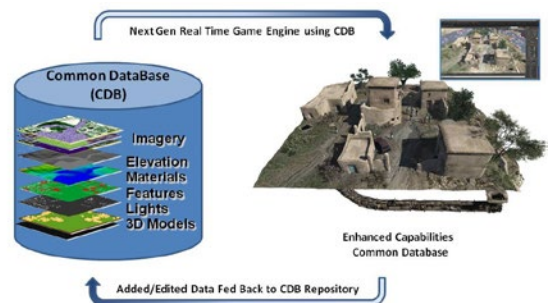
The High Stakes Negotiation Program, developed and implemented by Getting More, Inc., located in Philadelphia, PA, consists of interactive courses based on the Getting More negotiations model developed by Professor Stuart Diamond. The model focuses on interpersonal communications, perceptions, and emotions in order to achieve clearly specified goals. The courses have been completed by various Special Operations personnel throughout the country and overseas to better prepare them for interpersonal interactions during their missions.



# TTD CURRENT PROJECTS

## Common Database in a Game Engine

RealTime Immersive, Inc., located in Orlando, FL, is developing an interface for a commercial game engine that supports massive multi-player online environments. The interface will run data through on-the-fly processing to publish U.S. Government data and information in an internal game engine format. This interface will improve the capabilities of ground, maritime, and air based military training and exercise operations, and will adhere to the Simulation Interoperability Standards Organization (SISO) Common Database (CDB) Shared Public Specifications (SPS).



## Explosive Response Overpressure and Safe Area Identification Program

Existing guidance for determining safe standoff distances during render-safe procedures and breaching operations with explosives is limited and does not account for several key factors such as interior or exterior locations, charge geometry effects, and tamping effects. Protection Engineering Consultants, LLC, located in Austin, TX, and the New Mexico Institute of Mining and Technology, located in Socorro, NM, are developing a training program to allow bomb squads and breachers to identify safe locations where they can perform their duties with minimal risk of injury from the blast and fragments produced by an IED or breaching charge, respectively. The training will include background in blast and fragment effects from detonation of typical IED and breaching charges, the use of visual computer animations to illustrate overpressure in urban settings, and development of a Safe Area Calculator (SAC) which will be provided to the participants for use in the field.





### Foreign Weapons 3D Training Models and Application

The Foreign Weapons 3D Models and Application is a combination of interactive 3D graphics and interactions delivered through mobile game engine technology to provide guided practice and performance support for foreign and non-standard weapon tasks. Adayana Government Group is developing the models and application to enable users to see the internal operation of the weapons and manipulate those weapons in 3D as well as practice field strip and armorer level detailed disassembly, reassembly, and function checks on a highly realistic, interactive, graphical representation of each weapon. The system will be delivered on PC-based browsers and mobile devices and will be accessible via a personal or government-owned mobile device (i.e., smartphone or tablet) that may be connected to a government network if desired and may be used without an internet connection.



### IED Scenarios for Public Safety Responders

IED Scenarios for Public Safety Responders is a scenario-based, 3D enhanced, distributed learning tool that Adayana Government Group is developing for enhancing the situational awareness and critical thinking skills of emergency responders who arrive first on the scene for threats from IEDs. This learning tool is intended to strengthen the reactions and capabilities of response personnel and various agencies and teams tasked with combating terrorism operations. Participants will be required to apply enhanced situational awareness and critical thinking skills in order to employ appropriate threat countermeasures pre- and post-incident. The tool will be delivered using a Government Learning Management System and/or DVD.



### RAILS-CHEM

Military and civilian responders often enter unknown environments that require split-second decisions based on instrument responses and visual cues. Spectral Labs, Inc., located in San Diego, CA, is developing the Realistic and Adaptive Interactive Learning System for Chemical Agent Response (RAILS-CHEM), an interactive, 3D, game-based immersive training simulator. RAILS-CHEM enables responders to control computer-simulated avatars and devices in a wide variety of realistic hazardous environments such as illicit labs or chemical warfare agent (CWA) events, which are not easily provided in classroom training situations. RAILS-CHEM realistically models chemical agent behaviors in indoor and outdoor environments, and accurately depicts instrument response based on the environment and operations selected by the trainee. RAILS-CHEM also requires proper choice of Personal Protective Equipment (PPE) to avoid health related symptoms. It enables instructors and administrators to easily tailor a wide range of environments (e.g., stadium events, subway stations, multi-story buildings) to their training requirements including severe threat materials, fire, smoke, and chemical weapons. For example, the CWA training module simulates a hydrogen cyanide attack in a subway environment and challenges the player to select appropriate protective gear, look for clues that a chemical weapons





attack has taken place, and use all of their simulated detectors to understand what has transpired. Non-playing characters exhibit expected symptoms and the avatar can experience health degradation based on Acute Exposure Guideline Level (AEGl) values with low health animations as well as death animations. The duration of each training module is minimal—5 to 15 minutes—to imitate realistic, quick response situations and avoid scheduling impact on routine responder activities.



### Squad Leader Training

Design Interactive, Inc., located in Oviedo, FL, is implementing and evaluating simulation-based training packages for small unit leader decision making skills, especially under high stress situations such as leadership in a patrol, or in offensive, defensive, and urban operations. Each package includes four scenarios developed for the battlefield simulation system Virtual Battlespace 2 (VBS2), four pre-brief videos, and associated tools.

## TTD MEMBERSHIP

### Intelligence Community

### InterAgency Board

### National Bomb Squad Commanders Advisory Board

### National Tactical Officers Association

### U.S. Agency for International Development

### U.S. Department of Defense

- Defense Intelligence Agency
- Joint Improvised Explosive Device Defeat Office
- Office of the Under Secretary of Defense for Personnel and Readiness
- Pentagon Force Protection Agency
- U.S. Army Asymmetric Warfare Group

- U.S. Army John F. Kennedy Special Warfare Center and School

- U.S. Army Special Operations Command

- U.S. Marine Corps

- U.S. Marine Corps Special Operations Command

- U.S. Marine Training and Education Command

- U.S. Naval Special Warfare Command

- U.S. Special Operations Command

### U.S. Department of Homeland Security

- Federal Law Enforcement Training Center
- Homeland Security Investigations
- Office for Bombing Prevention
- Science and Technology Directorate

- Transportation Security Administration

- U.S. Coast Guard

- U.S. Customs and Border Protection

- U.S. Secret Service

### U.S. Department of Justice

- Bureau of Alcohol, Tobacco, Firearms and Explosives

- Federal Bureau of Investigation

- U.S. Marshals Service

### U.S. Department of State

- Bureau of Diplomatic Security
- Bureau of Counterterrorism



## EXPLOSIVE ORDNANCE DISPOSAL/ LOW-INTENSITY CONFLICT





# MISSION

The Explosive Ordnance Disposal/Low-Intensity Conflict (EOD/LIC) Program develops and delivers advanced capabilities for military EOD operators and SOF to meet the full spectrum challenge of addressing current and emerging threats presented by low-intensity conflict, unconventional and asymmetric warfare, and terrorist use of explosives.

# FOCUS AREAS

## **Access and Disablement**

Develop tools that quickly and efficiently breach or gain access to structures, barriers, vehicles, and containers. Develop chemical, mechanical, electrical, and explosively actuated systems for the neutralization and disruption of unexploded ordnance and improvised devices. Improve technologies for rendering fuzing and firing systems inoperable.

## **Detection, Diagnostics, and Analysis**

Develop tools to locate and verify the presence of improvised devices, unexploded ordnance, booby traps, and other threats. Develop technologies to determine the specific type, condition, and characteristics of unexploded ordnance and improvised device components, and the specific hazards associated with each. Improve methods to analyze and evaluate improvised device construction.

## **Protective Measures and Effects Mitigation**

Advance the development of personnel protection systems for operations in enhanced hazard environments. Develop novel and improved solutions to protect personnel and property from blast, fragmentation, and ballistic hazards.

## **Remote Operations and Advanced Mobility**

Develop capabilities to remotely approach, enter, and conduct reconnaissance operations in hazard areas and danger zones. Enhance mobility related technologies and equipment to facilitate safely approaching, operating in, and withdrawing from hazardous environments. Develop systems and technologies to gather and store operational information for transmission to operational personnel and unit commanders. Improve technologies for the relocation of unexploded ordnance, hazardous materials, and improvised devices.

## **Sustainability and Operations Management**

Develop tools and equipment to enhance situational awareness and operational capability during incident response or direct action operations. Develop human performance improvement tools that foster the advancement of knowledge related to unexploded ordnance, improvised devices, and enhanced hazard environments. Develop tools and training for conducting novel and advanced missions related to improvised devices and enhanced hazard environments.

[eodlic@eodlic.cttso.gov](mailto:eodlic@eodlic.cttso.gov)



## EOD/LIC COMPLETED PROJECT



### Underwater Explosive Threat Toolkit

The Underwater Explosive Threat Toolkit is a suite of tools for Navy EOD forces to conduct Render Safe Procedures against underwater explosive threats, including limpet mines and IEDs. The toolkit contains a modified limpet mine neutralization tool and an improved linear shaped charge, replacing the copper shaped charge liner in both tools with reactive materials. Currently the tools are designed to be placed manually; however, end users would like to emplace remotely once the core capability (employing an unmanned underwater vehicle) exists.

## EOD/LIC CURRENT PROJECT



### Next Generation EOD X-ray Generator

The Next Generation EOD X-ray Generator is an advanced X-ray generator system, providing enhanced capability to penetrate heavy barrier materials. The system will be designed to allow for easier integration into remote systems and incorporate digital scanning equipment currently in use by EOD forces. The system will provide modular capability for future advances in 3D X-ray imaging and will overlay targeting information in order to effectively defeat the device. Advances in technology allow the system to operate indefinitely and will increase resolution of target devices by more than 40 percent. The system will be smaller and lighter than comparable systems currently available.

## EOD/LIC MEMBERSHIP

### U.S. Department of Defense

- U.S. Air Force
  - Air Combat Command
  - Explosive Ordnance Disposal Technical Detachment (AFCEC/CXE)
- U.S. Army
  - 52nd Ordnance Group
  - Explosive Ordnance Disposal Technical Detachment

### • U.S. Marine Corps

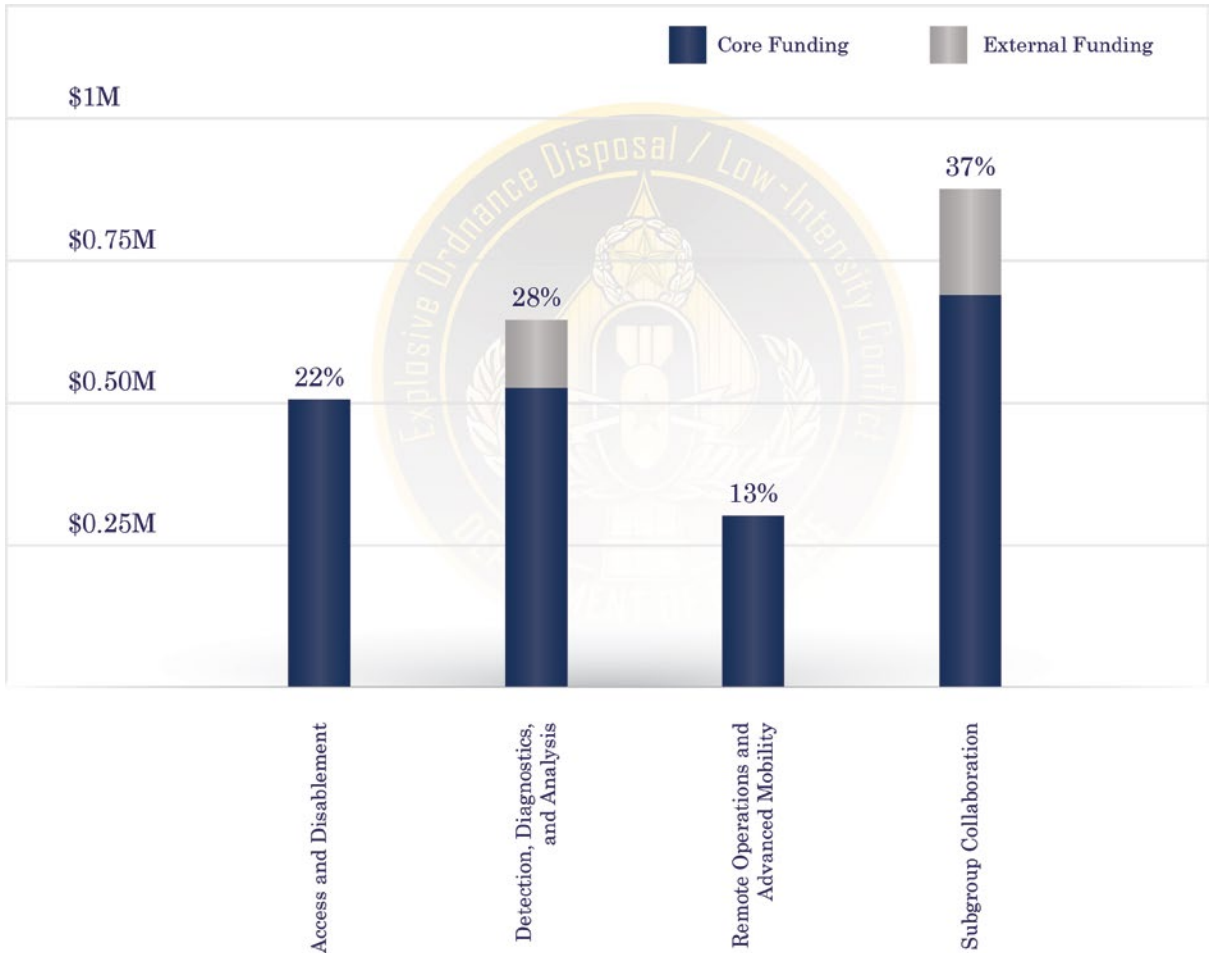
- Chemical Biological Incident Response Force
- Explosive Ordnance Disposal Detachment
- U.S. Navy
  - Explosive Ordnance Disposal Fleet Liaison Office
  - Explosive Ordnance Disposal Technology Division

### U.S. Department of Homeland Security

- U.S. Coast Guard



## EOD/LIC FISCAL YEAR 2014 PROJECT FUNDING (\$2.3M)





A photograph of soldiers on a rocky ridge overlooking a valley. The soldiers are positioned along the crest of a dark, layered rock formation. The valley below is a vast, flat expanse of land with some distant structures and roads. The sky is hazy and light-colored. A semi-transparent grey bar is overlaid on the right side of the image, containing the word 'APPENDIX' in white capital letters.

## APPENDIX



# BAA INFORMATION DELIVERY SYSTEM (BIDS)

The Broad Agency Announcement (BAA) Information Delivery System, better known as BIDS, works to support the CTTSO mission through the electronic publication of its annual BAAs. BAAs are the solicitation method of choice to bring the most urgent combating terrorism requirements forward for publication. CTTSO staff monitors BAA package instruction in light of submitter responses and feedback, and CTTSO implements improvements as needed each year to clarify the submission process.

To ensure the widest possible distribution to potential submitters, BAAs can be downloaded at the BIDS website (<http://www.bids.tswg.gov>) and are also advertised at the Federal Business Opportunities website (<http://www.fedbizopps.gov>). In addition to conventional government solicitation notices, the BIDS website provides a BIDS Advisory and Announcements page that posts BAA news, coming events, and partnering agency solicitations. In addition to the advisory, the RSS (really simple syndication) news feed allows interested users to receive real-time broadcast information at a local computer when connected to the Internet.

BIDS is a rich source of submitter information, providing small business outreach, online help, and guidance for offerers proposing the use of human subjects in research. Overall, BAA statistics are posted once the BAA closes.

BIDS not only functions as a response collection system, but also provides submission evaluation and submitter notification. Submitter data is fully protected in a 128-bit encrypted environment. Evaluators must comply with source selection data handling requirements and accept a nondisclosure agreement to access BIDS. In addition to the nondisclosure, evaluators must also certify that no conflict of interest exists before access is granted to any submissions. The evaluation process is monitored for timely notice to submitters with the typical response via an automated e-notice to complete within 90 days.

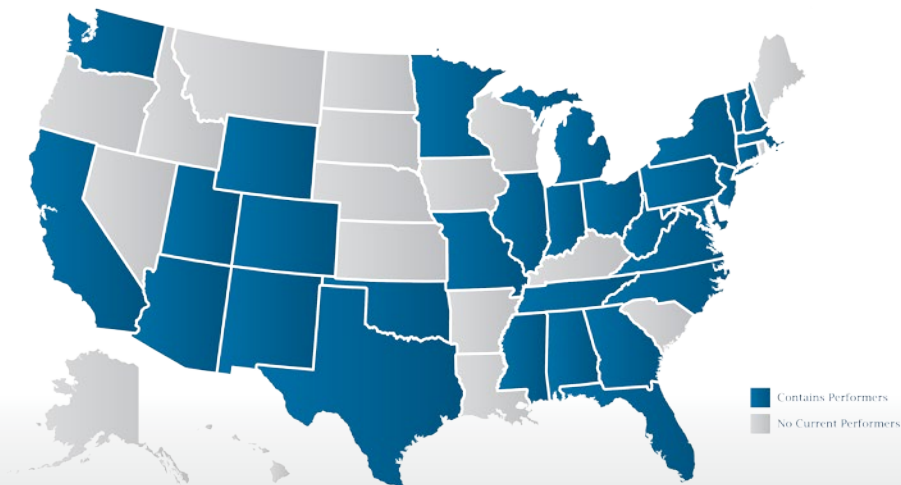
BIDS continues to serve as a leading solicitation process model for other federal programs by providing a streamlined electronic solution to receive proposals, providing access for subject matter expert evaluation, processing submissions through the approving authority, notifying the submitter of status, and maintaining a record of solicitation results.







## 2014 PERFORMERS



### International Performers



### Alabama

Army Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Redstone Arsenal

Army Corps of Engineers Protective Design Center, Huntsville

Kailos Genetics, Inc., Huntsville

### Arizona

Arizona State University, Phoenix

Cummings Engineering Consultants, Inc., Chandler

Metris, LLC, Mesa

Pacific Scientific Energetic Materials Company, Chandler

### California

AeroVironment, Inc., Monrovia

Creative Radicals, LLC, Sausalito

Decision Sciences International Corporation, Poway

Kallos Studios, Carlsbad

Lawrence Livermore National Laboratory, Livermore

Naval Air Weapons Station, China Lake

Naval Health Research Center, San Diego

Naval Postgraduate School, Monterey

Naval Research Laboratory, Marine Meteorology Division, Monterey

Palantir USG, Inc., Palo Alto





Quantum Magnetics, Inc., San Diego  
 RAND Corporation, Santa Monica  
 Science Applications International Corporation, San Diego  
 Spectral Labs, Inc., San Diego  
 SRI International, Menlo Park  
 System Technology, Inc., Hawthorne  
 University of California, Davis  
 XRSciences, LLC, Carlsbad

### **Colorado**

Applied Research Associates, Inc., Littleton  
 APTEK, Inc., Colorado Springs  
 Colorado State University, Fort Collins  
 NEK Advanced Securities Group, Inc., Colorado Springs  
 RadiantBlue Technologies, Inc., Colorado Springs  
 Rocky Mountain Scientific Laboratory, Littleton

### **Connecticut**

Naval Submarine Medical Research Laboratory, Groton

### **District of Columbia**

Bureau of Alcohol, Tobacco, Firearms and Explosives  
 DecisionQ Corporation  
 First Mile Geo  
 Gallup, Inc.  
 Library of Congress, Federal Research Division  
 Naval Research Laboratory

### **Florida**

Air Force Research Laboratory, Tyndall Air Force Base  
 AMP Research, Inc., Naples  
 Cubic Defense Applications, Orlando  
 Design Interactive, Inc., Oviedo  
 Florida Atlantic University, Boca Raton  
 Florida International University, Miami  
 Harris, Melbourne  
 National Forensic Science Technology Center, Largo  
 Naval Air Warfare Center, Key West  
 Naval Surface Warfare Center, Panama City  
 Navy Experimental Diving Unit, Panama City

Ocean Optics, Inc., Dunedin  
 RealTime Immersive, Inc., Orlando  
 Studio 14b, LLC, Safety Harbor  
 Titus Human Performance Solutions, LLC, Tallahassee  
 Unconventional Concepts, Inc., Mary Esther  
 Visual Awareness Technologies and Consulting, Inc., Tampa

### **Georgia**

Georgia Tech Research Institute, Atlanta  
 VELOXITI, Inc., Alpharetta

### **Illinois**

Argonne National Laboratory, Argonne  
 University of Illinois at Urbana-Champaign, Champaign

### **Indiana**

Purdue University, West Lafayette

### **Maryland**

Army Communications-Electronics Research, Development and Engineering Center (CERDEC)  
 Intelligence and Information Warfare Directorate (I2WD), Aberdeen Proving Ground  
 Army Evaluation Center, Aberdeen Proving Ground  
 Army Garrison Adelphi Laboratory Center, Hagerstown  
 Army Research Laboratory, Aberdeen Proving Ground  
 Army Research Laboratory, Human Research and Engineering Directorate, Adelphi  
 Avon Protection Systems, Inc., Belcamp  
 Axom Technologies, Inc., Annapolis Junction  
 Digital Infuzion, Inc., Gaithersburg  
 Edgewood Chemical Biological Center, Aberdeen Proving Ground  
 ELTA North America, Fulton  
 Hardwire, LLC, Pocomoke City  
 Impact Computing Corporation, Silver Spring  
 Johns Hopkins University Applied Physics Laboratory, Laurel  
 Naval Surface Warfare Center (NSWC), Indian Head  
 NSWC, Explosive Ordnance Disposal Technology Division, Indian Head



Roboteam North America, Bethesda  
Sierra Nevada Corporation, Integrated Mission Systems, Hagerstown  
Smiths Detection, Inc., Belcamp  
W.L. Gore & Associates, Inc., Elkton

### **Massachusetts**

908 Devices, Inc., Boston  
Aptima, Inc., Woburn  
Avwatch, Inc., Plymouth  
Charles River Analytics, Inc., Cambridge  
Excellims Corporation, Maynard  
FLIR Systems, Inc., Boston  
Massachusetts Institute of Technology, Lincoln Laboratory, Lexington  
Morpho Detection, Inc., Wilmington  
Physical Sciences, Inc., Andover  
Pixel Forensics, Inc., Burlington  
Raytheon BBN Technologies, Cambridge  
Thermo Fisher Scientific, Inc., Wilmington

### **Michigan**

Avon Protection Systems, Inc., Cadillac  
Baker Enterprises, Inc., Alpena  
Cybernet Systems Corporation, Ann Arbor  
Global Military Experts Consulting and Instruction, LLC, Sterling Heights  
Quantum Signal, LLC, Saline

### **Minnesota**

GreenZone Systems, Inc., Minneapolis

### **Mississippi**

Army Engineer Research and Development Center, Vicksburg  
Kopis Mobile, LLC, Flowood  
Mississippi State University, Mississippi State  
Stark Aerospace, Inc., Starkville

### **Missouri**

Midwest Research Institute, Kansas City  
MRIGlobal, Kansas City  
Washington University, St. Louis

### **New Hampshire**

Globe Manufacturing Company, LLC, Pittsfield  
HALO Maritime Defense Systems, Newton  
Kollsman, Inc. / Elbit Systems of America, Merrimack  
Warwick Mills, Inc., New Ipswich  
Wilcox Industries Corporation, Newington

### **New Jersey**

Army Armament Research, Development and Engineering Center, Picatinny Arsenal  
Sterling Medical Devices, Rochelle Park  
Structured Materials Industries, Inc., Piscataway

### **New Mexico**

Applied Research Associates, Inc., Albuquerque  
Energetic Materials Research and Testing Center, Socorro  
Los Alamos National Laboratory, Los Alamos  
National Assessment Group, Kirtland Air Force Base  
Sandia National Laboratories, Albuquerque

### **New York**

Flashpoint Partners, New York  
GE Global Research, Niskayuna  
International Biometric Group, LLC, New York  
Lockheed Martin Mission Systems and Training, Owego  
Persistent Systems, LLC, New York  
SRC, Inc., Syracuse  
Syracuse University, Syracuse

### **North Carolina**

Advanced Mission Systems, Charlotte  
Emerging Technology Support, LLC, Mooresville  
Horizon Performance, LLC, Cary



Partnership for Defense Innovation, Fayetteville  
Textile Protection and Comfort Center, College of  
Textiles, North Carolina State University, Raleigh  
Vertical Innovation Associates, Inc., Fayetteville

### **Ohio**

Battelle Memorial Institute, Columbus  
Lion Apparel, Inc., Dayton  
nVisti Tactical Innovation, Inc., Cleveland

### **Oklahoma**

Southwest Research Institute, Oklahoma City

### **Pennsylvania**

BAE Systems, Inc., Philadelphia  
Getting More, Inc., Philadelphia  
RE2, Inc., Pittsburgh  
University of Pennsylvania, Philadelphia

### **Tennessee**

eSpin Technologies, Inc., Chattanooga  
Universal Strategy Group, Inc., Mount Pleasant

### **Texas**

Accuracy 1st, Inc., Canadian  
Applied Research Associates, Inc., San Antonio  
DetectaChem, Houston  
G2 Associates, LLC, Rockwall  
International Personnel Protection, Inc., Austin  
Praevius Group, Inc., Salado  
Protection Engineering Consultants, LLC, Austin  
Raytheon, Garland  
Sense Technologies, LLC, San Antonio  
Texas A&M University, College Station  
University of Texas at Dallas, Richardson

### **Utah**

Dugway Proving Ground, Dugway  
Torion Technologies, Inc., American Fork

### **Vermont**

Sound Innovations, Inc., White River Junction

### **Virginia**

Adayana Government Group, Falls Church  
Applied Research Associates, Inc., Arlington  
AppTek, McLean  
Baker Engineering and Risk Consultants, Inc., Arlington  
Battelle Memorial Institute, Arlington  
BCF Solutions, Inc., S4 Tech Division, Sterling  
Black Tree, LLC, Ashburn  
Blackbird Technologies, Inc., Herndon  
Bode Technology Group, Inc., Lorton  
Caerus Associates, Arlington  
Center for Naval Analyses, Arlington  
Combined Arms Support Command (CASCOM)  
Sustainment Center of Excellence (SCoE) Mobile, Ft. Lee  
Conflict Kinetics Corporation, Sterling  
CONTROP USA, Inc., Manassas  
Corporation for National Research Initiatives, Reston  
Defense Life Sciences, Inc., Alexandria  
Engility Corporation, Chantilly  
Federal Bureau of Investigation, Quantico  
G3 Technologies, Inc., Ashburn  
HumanGeo, Arlington  
Information Systems Worldwide, Arlington  
Intelligent Decision Partners, LLC, Reston  
Joint Non-Lethal Weapons Directorate, Quantico  
Leidos, Inc., Reston  
ManTech International Corporation, Chantilly  
Naval Surface Warfare Center, Dahlgren  
NexGen Communications, LLC, Dulles  
Night Vision and Electronic Sensors Directorate, Ft. Belvoir  
Parsons Corporation, Centreville  
Science Applications International Corporation, McLean  
SDL Federal Solutions, Inc., Herndon  
Segue Technologies, Inc., Arlington  
Shoulder 2 Shoulder, Inc., Arlington  
System of Systems Analytics, Inc., Fairfax  
SyTech Corporation, Alexandria  
Threat Knowledge Group, LLC, McLean  
White Canvas Group, Arlington  
ZTI Solutions, LLC, Arlington





## Washington

Analytic Methods, Redmond  
The Boeing Company, Seattle  
Cascade Designs, Inc., Seattle  
Pacific Northwest National Laboratory, Richland

## West Virginia

Azimuth, Inc., Morgantown  
EyeMarker Systems, Inc., Morgantown  
West Virginia Army National Guard, Camp Dawson

## Wyoming

Snowy Range Instruments, Laramie

# INTERNATIONAL

## Australia

Australian Emergency Management, Canberra, Australian Capital Territory  
Australian Nuclear Science and Technology Organisation, Lucas Heights, New South Wales  
Catapult Innovations, Scoresby, Victoria  
ChemCentre, Bentley, Western Australia  
Defence Science and Technology Organisation, Canberra, Australian Capital Territory  
Defence Science and Technology Organisation, Edinburgh, South Australia  
Defence Science and Technology Organisation, Melbourne, Victoria  
Flinders University, Adelaide, South Australia  
Queensland Fire and Emergency Services, Brisbane, Queensland  
Queensland University of Technology, Brisbane, Queensland  
Semantic Science Pty. Ltd., Stirling, South Australia  
University of Adelaide, Adelaide, South Australia  
University of Canberra, Canberra, Australian Capital Territory  
University of Tasmania, Hobart, Tasmania  
University of Technology, Sydney, New South Wales

## Canada

AirBoss Defense, Acton Vale, Quebec  
Biokinetics & Associates, Ltd., Ottawa, Ontario  
Canadian Border Services Agency, Ottawa, Ontario

Defence Research and Development Canada, Ottawa, Ontario  
Defence Research and Development Canada, Suffield, Alberta  
Defence Research and Development Canada, Valcartier, Quebec  
Martec, Ltd., Halifax, Nova Scotia  
Oculus Info, Inc., Toronto, Ontario  
Ottawa Fire Services, Ottawa, Ontario  
Public Health Agency of Canada, Winnipeg, Manitoba  
Royal Canadian Mounted Police, Ottawa, Ontario  
The SecDev Group, Ottawa, Ontario  
Toronto Police Service, Toronto, Ontario  
Transport Canada, Ottawa, Ontario

## Germany

University of Bonn, Bonn

## Israel

Assatec, Ltd., Nahariya  
DEA Research and Development, Ltd., Jerusalem  
Elbit Systems, Ltd., Yokneam  
Electro-Optics Industries, Ltd., Rehovot  
GenoSmart, Ltd., Reut  
Israel Defense Forces  
Israel Institute for Biological Research, Ness Ziona  
Israel Ministry of Defense, Tel Aviv  
Israel Police, Jerusalem



Israel Security Agency, Tel Aviv  
Nuclear Research Center, Negev  
PrevenTech, Ltd., Jerusalem  
Roboteam, Ltd., Tel Aviv  
Sky Sapience, Ltd., Yokneam  
Tamar Explosives, Ltd., Tel Aviv  
Tel Aviv University, Tel Aviv  
Zickel Engineering, Ltd., Haifa

### **Netherlands**

Netherlands Organisation for Applied Scientific Research, Delft

### **Singapore**

Defence Science and Technology Agency

### **United Kingdom**

Buckler Davies Consultancy, Ltd., Swindon  
Centre for the Protection of National Infrastructure  
Cobalt Light Systems, Ltd., Abingdon  
Defence Science and Technology Laboratory, Fort Halstead  
Defence Science and Technology Laboratory, Porton Down  
Digital Barriers, Plc., London  
Home Office Scientific Development Branch, Sandridge  
LGC, Ltd., Teddington  
Ministry of Defence Counter Terrorism Science and Technology Center, Salisbury  
Ministry of Defence, London  
New Century Consulting, Ltd., London  
QinetiQ Group, Plc., Farnborough  
Saab Seaeye, Ltd, Fareham  
Serious Organized Crime Agency, London



## GLOSSARY OF ACRONYMS

---

<b>3D</b>	Three Dimensional
<b>AAC</b>	Advanced Analytic Capabilities
<b>ACH</b>	Advanced Combat Helmet
<b>AEGL</b>	Acute Exposure Guideline Level
<b>AOR</b>	Area of Responsibility
<b>ARSOF</b>	Army Special Operations Forces
<b>ASD SO/LIC</b>	Assistant Secretary of Defense for Special Operations / Low-Intensity Conflict
<b>AVB</b>	Active Vehicle Barrier
<b>AWC</b>	Automatic Wire Cutter
<b>BAA</b>	Broad Agency Announcement
<b>BIDS</b>	BAA Information Delivery System
<b>BOLT</b>	Broad Operational Language Translation
<b>BRITE</b>	Biometrics, Recognition, Identity Management, Tracking, and Exploitation
<b>C2IS2</b>	Cognitive Counter-Improvised Explosive Device Signature System
<b>CASO</b>	Cyber Advanced Support Operations
<b>CB</b>	Chemical and Biological
<b>CBRNE</b>	Chemical, Biological, Radiological, Nuclear, and Explosives
<b>CDB</b>	Common Database
<b>CFD</b>	Computational Fluid Dynamics
<b>C-IED</b>	Counter-Improvised Explosive Device
<b>COA</b>	Course of Action
<b>CODIS</b>	Combined DNA Index System
<b>CTTSO</b>	Combating Terrorism Technical Support Office
<b>CWA</b>	Chemical Warfare Agent
<b>DARPA</b>	Defense Advanced Research Projects Agency
<b>DIVD</b>	Digital Interactive Visual Dictionary
<b>DMC</b>	Digital Magnetic Compass
<b>DoD</b>	Department of Defense
<b>DOS</b>	Department of State
<b>DOT</b>	Department of Transportation
<b>DRDC</b>	Defence Research and Development Canada
<b>EMTAS-Mobile</b>	Enhanced Mortar Targeting System – Mobile
<b>ENFSI</b>	European Network of Forensic Science Institutes
<b>EO</b>	Electro-Optical
<b>EO/IR</b>	Electro-Optical / Infrared
<b>EOD/LIC</b>	Explosive Ordnance Disposal / Low-Intensity Conflict



<b>FAA</b>	Federal Aviation Administration
<b>FMV</b>	Full Motion Video
<b>FMVS</b>	Federal Motor Vehicle Safety
<b>FY</b>	Fiscal Year
<b>GCS</b>	Ground Control Station
<b>GPS</b>	Global Positioning System
<b>GUI</b>	Graphical User Interface
<b>GVW</b>	Gross Vehicle Weight
<b>HD</b>	High Definition
<b>HMCASS</b>	Head Mounted Credibility Assessment Screening System
<b>HME</b>	Homemade Explosives
<b>HRP</b>	High Risk Personnel
<b>IDD</b>	Improvised Device Defeat
<b>IED</b>	Improvised Explosive Device
<b>IEEE</b>	Institute of Electrical and Electronics Engineers
<b>IFS</b>	Investigative and Forensic Science
<b>IG/T</b>	Interdepartmental Group on Terrorism
<b>IMS</b>	Ion-Mobility Spectrometry
<b>IR</b>	Infrared
<b>ISO</b>	International Standards Organization
<b>ISR</b>	Intelligence, Surveillance, and Reconnaissance
<b>IW/ET</b>	Irregular Warfare and Evolving Threats
<b>IWG/CT</b>	Interagency Working Group on Counterterrorism
<b>IWS</b>	Irregular Warfare Support
<b>JIEDDO</b>	Joint Improvised Explosive Device Defeat Organization
<b>LP</b>	Laser Pointer
<b>LRF</b>	Laser Range Finder
<b>MADCAT</b>	Multilingual Automatic Document Classification, Analysis, and Translation
<b>MANET</b>	Mobile Ad-hoc Network
<b>MARS</b>	Man-Portable Aerial Radar System
<b>MCLSUAS</b>	Maritime Canister Launched Small Unmanned Aviation System
<b>MDMP</b>	Military Decision Making Process
<b>MEAP</b>	Model Enabled Analysis and Planning
<b>MFE</b>	Multi-Functional Earpiece
<b>MPC</b>	Model Predictive Control
<b>MTGR</b>	Micro Tactical Ground Robot
<b>NFPA</b>	National Fire Protection Association
<b>NG-TacMN</b>	Next Generation Tactical Mesh Network
<b>NIJ</b>	National Institute of Justice
<b>NSA</b>	National Security Agency
<b>NSWC</b>	Naval Surface Warfare Center





<b>NVD</b>	Night Vision Device
<b>OCR</b>	Optical Character Recognition
<b>OEM</b>	Original Equipment Manufacturer
<b>PGB</b>	Portable Glove Box
<b>POP</b>	Plug-in Optronics Payload
<b>PP</b>	Personnel Protection
<b>PPE</b>	Personal Protective Equipment
<b>PR</b>	Personnel Recovery
<b>PS</b>	Physical Security
<b>PTMMS</b>	Personal Tactical Micro Marker System
<b>QDR</b>	Quadrennial Defense Review
<b>RAILS-CHEM</b>	Realistic and Adaptive Interactive Learning System for Chemical Agent Response
<b>ROCU</b>	Ruggedized Operator Control Unit
<b>RSS</b>	Really Simple Syndication
<b>RVT</b>	Remote Video Terminals
<b>SABER</b>	SOF Advanced Ballistic Engine and Rangefinder
<b>SAC</b>	Safe Area Calculator
<b>SAPBER</b>	Semi-Autonomous Pipe Bomb End-Cap Removal
<b>SCOS</b>	Surveillance, Collection, and Operations Support
<b>SEAL</b>	U.S. Navy's Sea, Air, Land Teams
<b>SISO</b>	Simulation Interoperability Standards Organization
<b>SNP</b>	Single Nucleotide Polymorphism
<b>SO/LIC</b>	Special Operations / Low-Intensity Conflict
<b>SOF</b>	Special Operations Forces
<b>SORS</b>	Spatially Offset Raman Spectroscopy
<b>SPS</b>	Shared Public Specifications
<b>SSR</b>	Simple Sequence Repeats
<b>SWB C-IED WG</b>	Southwest Border Counter-Improvised Explosive Device Working Group
<b>TAP</b>	Temporary Anti-Personnel
<b>TBI</b>	Traumatic Brain Injury
<b>TLE</b>	Target Location Error
<b>TNT</b>	Trinitrotoluene
<b>TOS</b>	Tactical Operations Support
<b>TPMK</b>	Tactical Platform Marking Kit
<b>TSWG</b>	Technical Support Working Group
<b>TTHAISR</b>	Tactical Tethered Hovering Aerial ISR
<b>UAS</b>	Unmanned Aerial System
<b>UAS</b>	Unmanned Aviation System



<b>UAV</b>	Unmanned Aerial Vehicle
<b>UVE</b>	Underwater Vision Enhancement
<b>UWIED</b>	Underwater Improvised Explosive Device
<b>VAST</b>	Visual Analytics Science and Technology
<b>VBIED</b>	Vehicle-Borne Improvised Explosive Device
<b>VBS2</b>	Virtual Battlespace 2
<b>VOIP</b>	Voice-Over Internet Protocol



## PHOTO CREDITS

---

<b>Cover</b>	DoD photo illustration by Lance Cpl. Aaron S. Patterson, U.S. Marine Corps/Released U.S. Marine Corps photo by Lance Cpl. Andrew Koppers/Released Photo by Matthew Rice. "Night Shift." June 9, 2008. <a href="https://www.flickr.com/photos/standingstillfromtoday/2566928348/">https://www.flickr.com/photos/standingstillfromtoday/2566928348/</a>
<b>Pages 4-5</b>	DoD photograph by Sgt. Artur Shvartsberg, U.S. Marine Corps/Released
<b>Pages 10-11</b>	DoD photo by Cpl. Scott Reel, U.S. Marine Corps/Released
<b>Page 20</b>	Photo by Lance Cpl. Cayce Nevers
<b>Page 43</b>	Photo by Lance Cpl. Tyler Reiriz
<b>Page 70</b>	U.S. Army photo by Visual Information Specialist Markus Rauchenberger/Released
<b>Page 80</b>	DoD photo by Spc. Steven Cope, U.S. Army/Released





[WWW.CTTSO.GOV](http://WWW.CTTSO.GOV)